The responsive eye

By William C. Seitz. The Museum of Modern Art, New York, in collaboration with the City Art Museum of St. Louis [and others

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THE RESPONSIVE EYE

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The Responsive Eye

BY WILLIAM C. SEITZ

THE MUSEUM OF MODERN ART, NEW YORK

IN COLLABORATION WITH THE CITY ART MUSEUM OF ST. LOUIS, THE CONTEMPORARY ART COUNCIL OF THE SEATTLE ART MUSEUM, THE PASADENA ART MUSEUM AND THE BALTIMORE MUSEUM OF ART

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ACKNOWLEDGMENTS

Although an appropriate title had not yet been determined, *The Responsive Eye* was announced in November, 1962. Besides showing recent works with a primarily visual emphasis, it was to have documented the development from Impressionism to what came later to be called "optical" art. So rapid was the subsequent proliferation of painting and construction employing perceptual effects however that demands of the present left no time nor gallery space for a retrospective view.

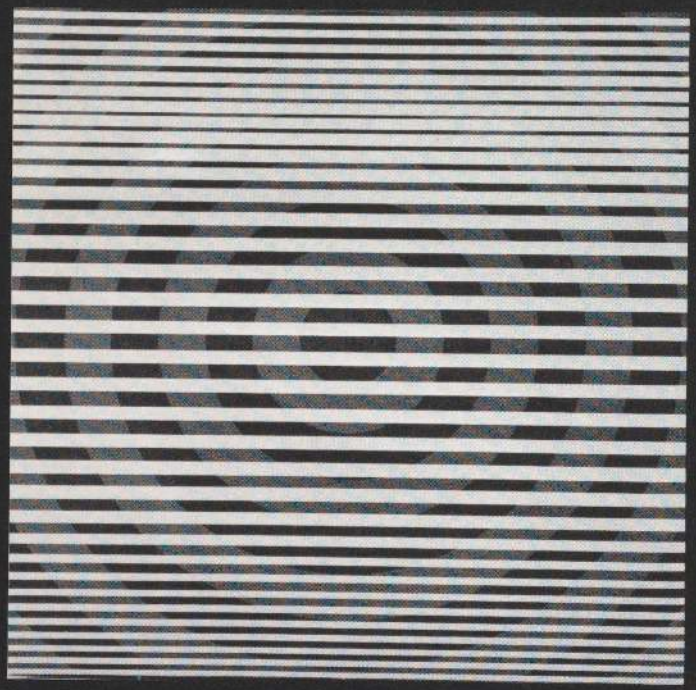
Albers and Vasarely are the best-known masters of perceptual abstraction, and they are represented with a few more works than other exhibitors. This attention does not imply, however, that they are the sole initiators of such a multiform and widely spread tendency. Many artists, from Balla, Malevich, and Mondrian to several of those here exhibited must also be seen as originators of some aspect of perceptualism. The various roots of "optical" and less pointedly ophthalmic painting and construction will be studied in detail in a book scheduled to appear after the exhibition. They branch in several directions, going beyond what we call "art" into graphic design, technology, psychology and other sciences.

Important assistance in ferreting out artists of more than fifteen countries, many of them unknown in the United States when work on the exhibition was begun, was given to us by George Rickey, who opened the files and correspondence for his forthcoming book, *Heirs of Constructivism*, at a stage when less generous authors would have kept them under lock and key. Madame Denise Rene, whose gallery in Paris was a fortress of geometric art during its lean years, gave her cooperation and expert advice.

On behalf of the Trustees of The Museum of Modern Art, the City Art Museum of St. Louis, the Contemporary Art Council of the Seattle Art Museum, the Pasadena Art Museum and The Baltimore Museum of Art, it is a pleasure to thank those who worked on the exhibition and the catalogue: Alicia Legg for curatorial assistance, Jennifer Licht for preparing the catalogue and biographical notes, Margaret A. Hargreaves, who handled a long and complex correspondence, and Helen M. Franc for suggesting the final title of the exhibition. The catalogue was designed by Joseph Bourke Del Valle of the Museum's Department of Publications, directed by Francoise Boas. Dorothy H. Dudley, Registrar, supervised the difficult problems of shipping and handling fragile works with her customary skill.

Gratitude is also extended to the artists, collectors, museums and dealers who have lent works; and, for special assistance, to Mrs. Bagley Wright, Mr. and Mrs. Robert C. Scull and Mr. Arnold Glimcher.

William C. Seitz,
Curator of Painting and
Sculpture Exhibitions



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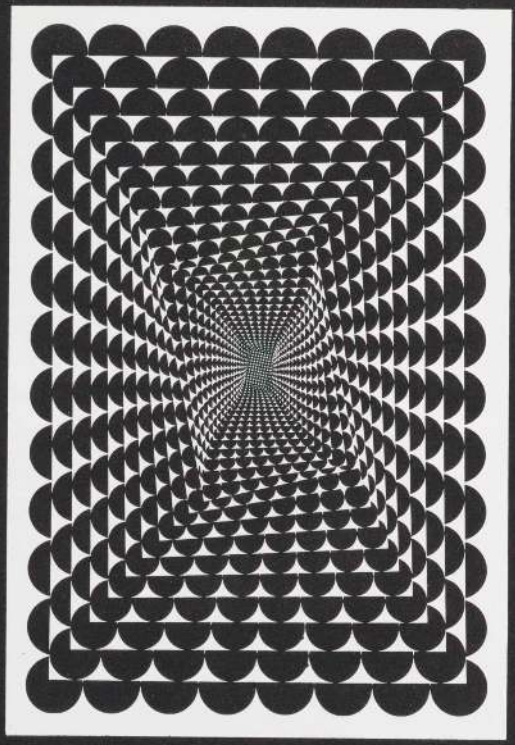

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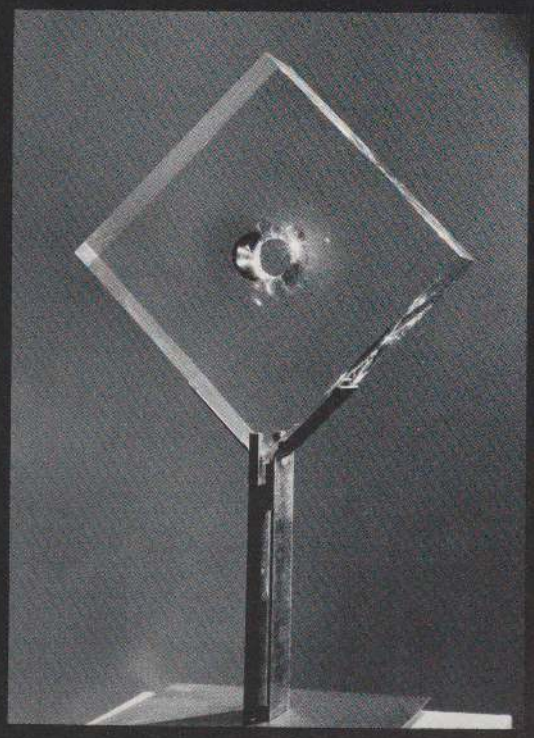

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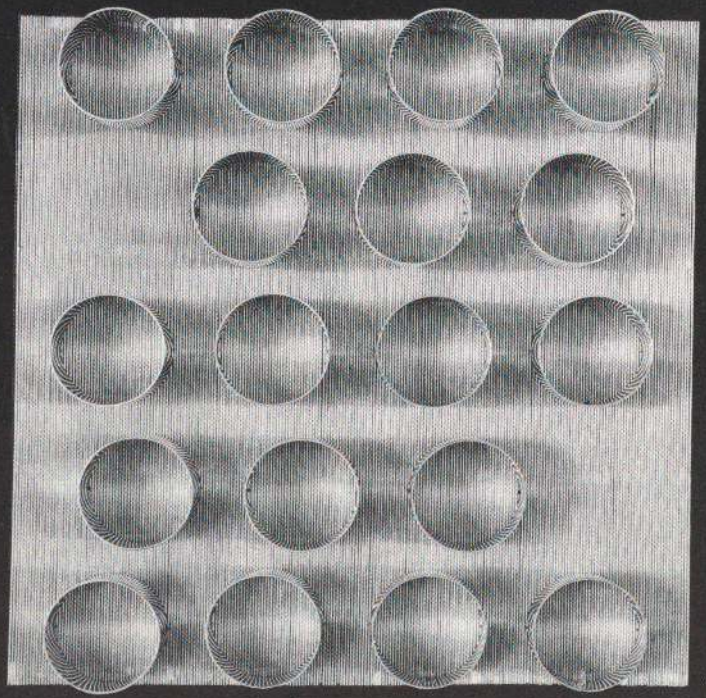

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IN A FAMOUS ESSAY written in 1883 about an exhibition of impressionist painting, the poet Jules Laforgue asserted that "the eye of the impressionist is . . . the most advanced eye in human evolution." Surely we do not believe (nor, one suspects, did Laforgue) that nineteenth-century eyes differ anatomically from those of previous epochs. The history of art provides voluminous evidence, however, that creative visualization has indeed changed from century to century and even from decade to decade. One must agree in general also with the contention that the perception of artists has not changed aimlessly but has evolved. The ideational images of pre-Greek representation gave way to the sculptural forms of antiquity and Renaissance Italy, after which visualization became progressively more optical, approaching a peak by the year of Laforgue's article—just at the time impressionism was about to be systematized by Seurat, Signac, and other neoimpressionists.

The work of some of the artists represented in this exhibition has been labeled "optical" or "retinal." Although these designations are in part correct, one must beware of assumptions as positivistic as those of the 1880s. On the basis of expanded knowledge, our idea of the "eye" must be more embracing. We know how hard it is to distinguish between seeing, thinking, feeling, and remembering. We know also that our knowledge of the billions of nerve paths and connections that relay images to the mind is incomplete.

At the end of the nineteenth century a controversy led by two famous German scientists raged as to whether the phenomenon of simultaneous contrast of colors was physiological, as Ewald Hering contended, or psychological, as Hermann von Helmholtz claimed. "To this day," Harry Asher wrote in 1961, "it is not known for certain whether the process underlying the effect takes place in the eye or the brain."

Back in the eighteenth century George Berkeley asserted that *esse* is *percipi*—that the existence of the physical world consists solely in its perceptibility—and Hume found the source of all conceptual thought in sense impressions. Later this view tended to be dismissed as solipsism. Writing on the subject of visual illusions late in the nineteenth century, the psychologist Oswald Külpe called them "subjective perversions of the contents of objective perception." But now, as Paul Kolers writes in a recent issue of *Scientific American*, most contemporary investigators regard illusions as "genuine perceptions that do not stand up when their implications are tested" and as "putting in question any belief in 'objective' perception."

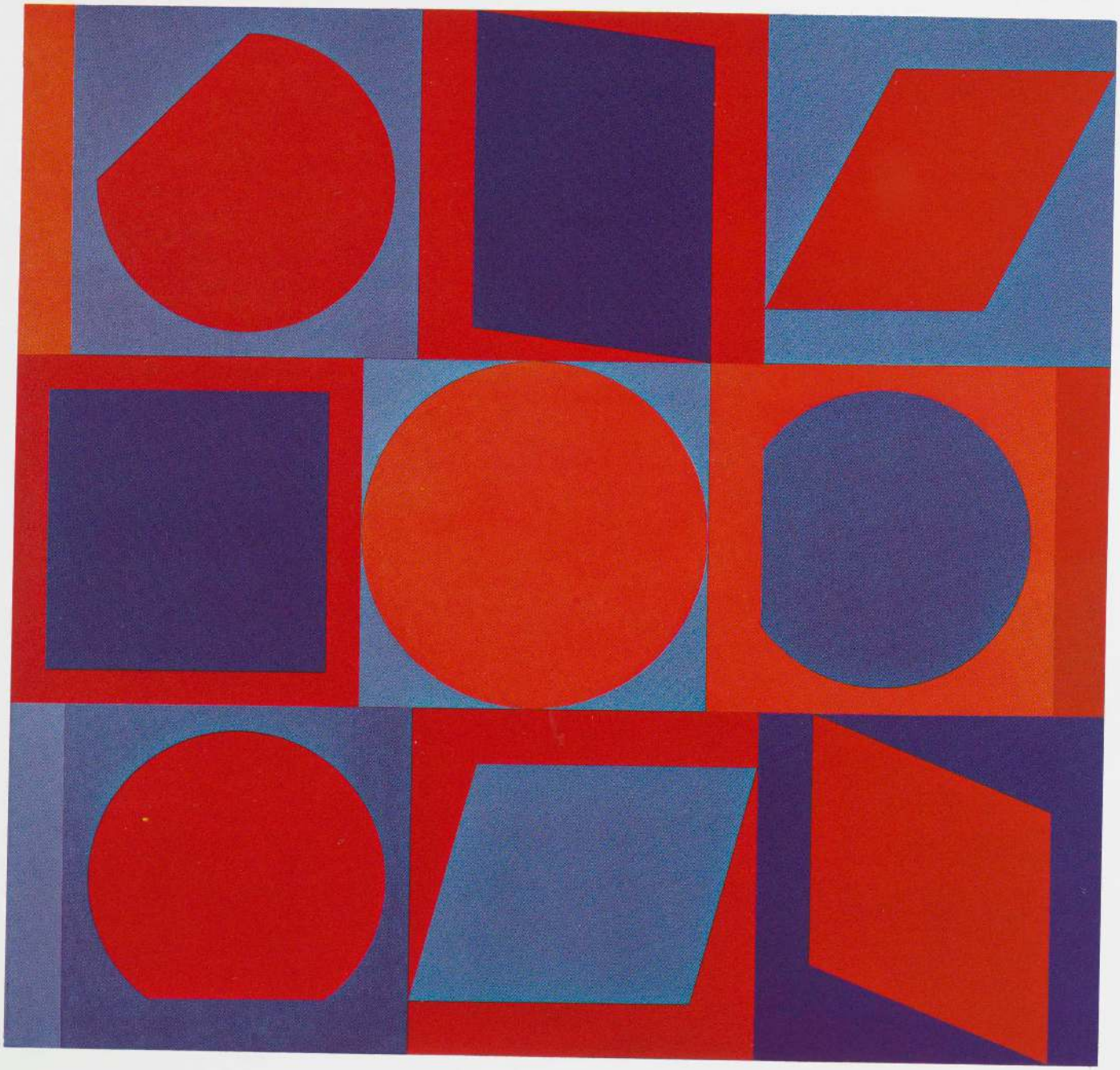
The "eye" referred to in our title cannot therefore be assumed to be identical with the anatomical orb or an inert optical instrument. In the light of present knowledge (or, more accurately, in realization of its incompleteness) the "eye" that responds seems almost as difficult to delimit as is the eye of the connoisseur. But, thus qualified, Laforgue's definition of an impressionist can be borrowed whole for the perceptual artist of 1965: "a modernist painter endowed with an uncommon sensibility of the eye." Impressionism and neoimpressionism were the peaks to which perceptual art was carried within

1. SEDGELY: *Blue and Green Modulation.* 1964. Emulsion on composition board, 39½ x 39½". Howard Wise Gallery, New York

2. STEELE: *Baroque Experiment: Fred Maddox.* 1964. Oil on canvas, 60 x 40". Collection The Hon. Anthony Samuel, London

3. POHL: *PX II/3010—59/64.* 1964. Plexiglas, 27¾ high including base x 16⅞ x 3⅞". The Joseph H.Hirshhorn Collection

4. GRUPPO N: *Unstable Perception.* 1963. Metal, 17⅞ x 18 x 3½". The Museum of Modern Art, New York, gift of the Olivetti Corporation



VASARELY: *Kalota*. 1963. Oil on canvas, 7′ x 6′ 8″ . Pace Gallery, New York

the limitations of representation. The perceptualism of the present, which barely existed twenty years ago except as a scientific study, is more concentrated than that of impressionism because the establishment of abstract painting has made it permissible for color, tone, line, and shape to operate autonomously.

When a critic or curator brings works of art together because of alleged common qualities he should make known the criteria that govern his selection, and the central principle toward which the various works point. *The Responsive Eye* is concerned not with only one tendency, group, or country but with groups and individuals representing tendencies from over fifteen countries. Before distinguishing one direction from another, however, it is essential to indicate those characteristics that—despite divergences of form, intention, ideology, or personal style—these paintings, reliefs, and constructions have in common.

PERCEPTUAL ABSTRACTION

Stripped of conceptual association, habits, and references to previous experience, perceptual responses would appear to follow innate laws, limited though our understanding of them may be. The eye responds most directly when nonessentials such as freely modulated shape and tone, brush gestures and impasto are absent. These means muffle and distort the purely perceptual effect of lines, areas, and colors.

All forms of representation, even ideographs, signs, and symbols, also alter or deflect whatever is innate in vision. (Horizontal lines and shapes tend to be avoided by perceptual painters, for example, because they suggest landscape.) The eye needs only the slightest clue to link an abstract shape to some past association with actual objects and space. Every work chosen for this exhibition, therefore, is entirely abstract.

Most often, areas of color or tone in perceptual painting are applied flat and hard edged; reliefs and constructions are fabricated of cleanly cut wood, glass, plastic, or metal. A degree of softening or variation of edging cannot be excluded, however, for it is efficacy, not theory, that governs a choice of means.

In 1952 Alfred H. Barr, Jr. wrote that the Dutch de Stijl movement was based on three elements: "in form the rectangle; in color the 'primary' hues, red, blue and yellow; in composition the asymmetric balance." By contrast, the vocabulary of perceptual abstraction is broader and differs from Mondrian and his school on all three points. It adds the diagonal, circle, and even more complex curves to the horizontal and vertical. Rectangles, squares, or circles are often used alone, as an entire image, or in concentric or radial arrangements. Uniform or slightly varied over-all patterns of dots, stripes, or lines are also common. The result, to borrow a phrase used by Rudolph Arnheim in reference to impressionism and cubism, "is a homogeneity that may well be termed 'atonal,' in that the relation to the underlying structural 'key' is given up and replaced

by a network of connections between the elements of the composition itself." Color in perceptual abstraction is entirely without limitation: with function as the criterion, it varies from the purest hues of the spectrum to grays and unrelieved black and white.

In sharp contrast with the composition of de Stijl, asymmetry is the exception rather than the rule. This break with the asymmetrical, relational composition so typical of most postcubist abstraction is of supreme importance to perceptual abstraction. Here is an art without relationships—more accurately, an art with a different order of relationships. The asymmetrical dialogues between large and small, above and below, empty and full, or bright and dull that took place across picture surfaces have been ended either by central placement or uniformity. Too much diversity of form impedes perceptual effect. Certain of these works therefore have a stronger family resemblance to mechanical patterns, scientific diagrams, and even to screens and textured surfaces than to relational abstract art.

Asymmetrical balance is sometimes also replaced by a new kind of symmetry. The static classical and Renaissance symmetry in which, as in pedimental sculpture, secondary elements flanked a dominant center of interest, had been anathema to previous abstract painting. With other aims, the new abstraction sometimes employs a quite nonclassical symmetry in which two identical or almost identical elements divide the picture into an equivocal either-or situation, often around an empty center as in Ellsworth Kelly's *Green Blue Red*. The observer is denied the security of a dominant central motif which, according to what psychologists call "the law of simplicity," the eye seeks. The division of the picture surface into two equally important foci stimulates a perceptual urge to fuse the two images into one, as with a stereoscopic viewer.

page 45

Exaggerated emphasis on centrality and an attempt, which is all but futile, to avoid its tyranny are poles between which perceptual composition oscillates. Dualistic symmetry (as well as the use of homogeneous patterns and dynamic "target" arrangements) suggests that the establishment of situations that activate or frustrate the mind's tendency to unify and tranquilize is a necessary condition of perceptual art. In certain cases similar elements are simply lined up across the surface, while in the canvases of Gene Davis or Guido Molinari, a focus is evaded by a progression of uniform color stripes that move rhythmically from one side to the other, surreptitiously slipping past the center, which Molinari calls "the point of no return."

pages 14-15, 12

PERCEPTUAL MOVEMENT

In impressionist painting heightened perception and optical movement in art began together, inseparably commingled. Nonobjective perceptual art arises first of all from immediate sense experience, as impressionism did, but it also draws on a variety of sources in art and science. Freed of representation, it concentrates more sharply, although in a narrower context, the obsession with movement typical of twentieth-century art.

Kinetic art—the art of mechanical movement—is the most evident outcome of the machine-age aesthetic trumpeted by Apollinaire and the Italian and Russian futurists. Perceptual and kinetic art have an intertwined development that cannot be totally disentangled; nevertheless perceptual, optical, or "virtual" movement—which always exists in tension with factual immobility—is an experience of a different order. Carefully controlled static images have the power to elicit subjective responses that range from a quiet demand made on the eyes to distinguish almost invisible color and shape differences to arresting combinations that cause vision to react with spasmodic afterimages. The countless possibilities of these mysterious phenomena are almost as difficult to enumerate as their psychological and physiological causes are to determine.

pages 25, 49

Before the advent of abstract art a picture was a window through which an illusion of the real world could be viewed, and a statue was a replica. Nonobjective painting and sculpture defined a work of art as an independent object as real as a chair or a table. Perceptual abstraction—its existence as an object de-emphasized or nullified by uniform surface treatment, reflective or transparent materials, and a battery of optical devices—exists primarily for its impact on perception rather than for conceptual examination. Ideological focus has moved from the outside world, passed through the work as object, and entered the incompletely explored region area between the cornea and the brain.

The varied works brought together here because of an historically significant similarity relate quite different means, materials, and aims. Discussion of main directions will be continued below under separate headings. No reference will be made to national, ideological or group alignments, and no effort will be made to place every work or artist under one of the six headings.

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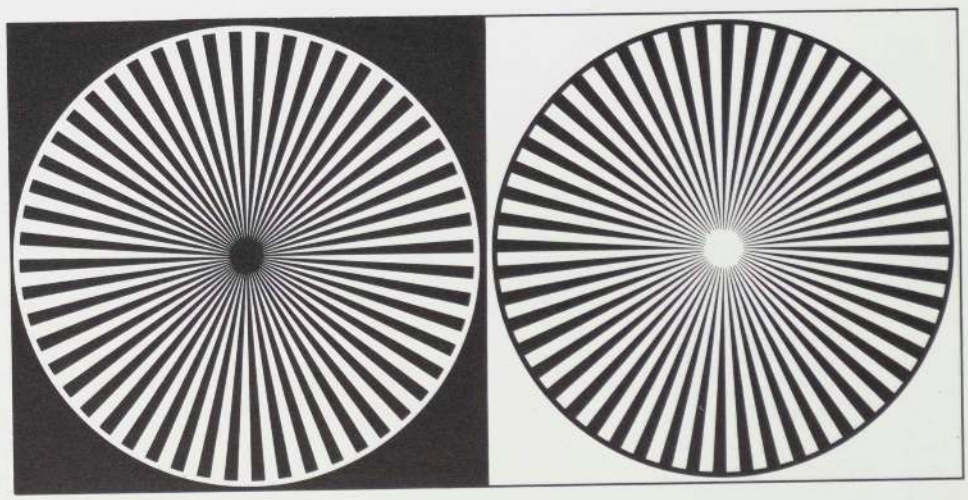
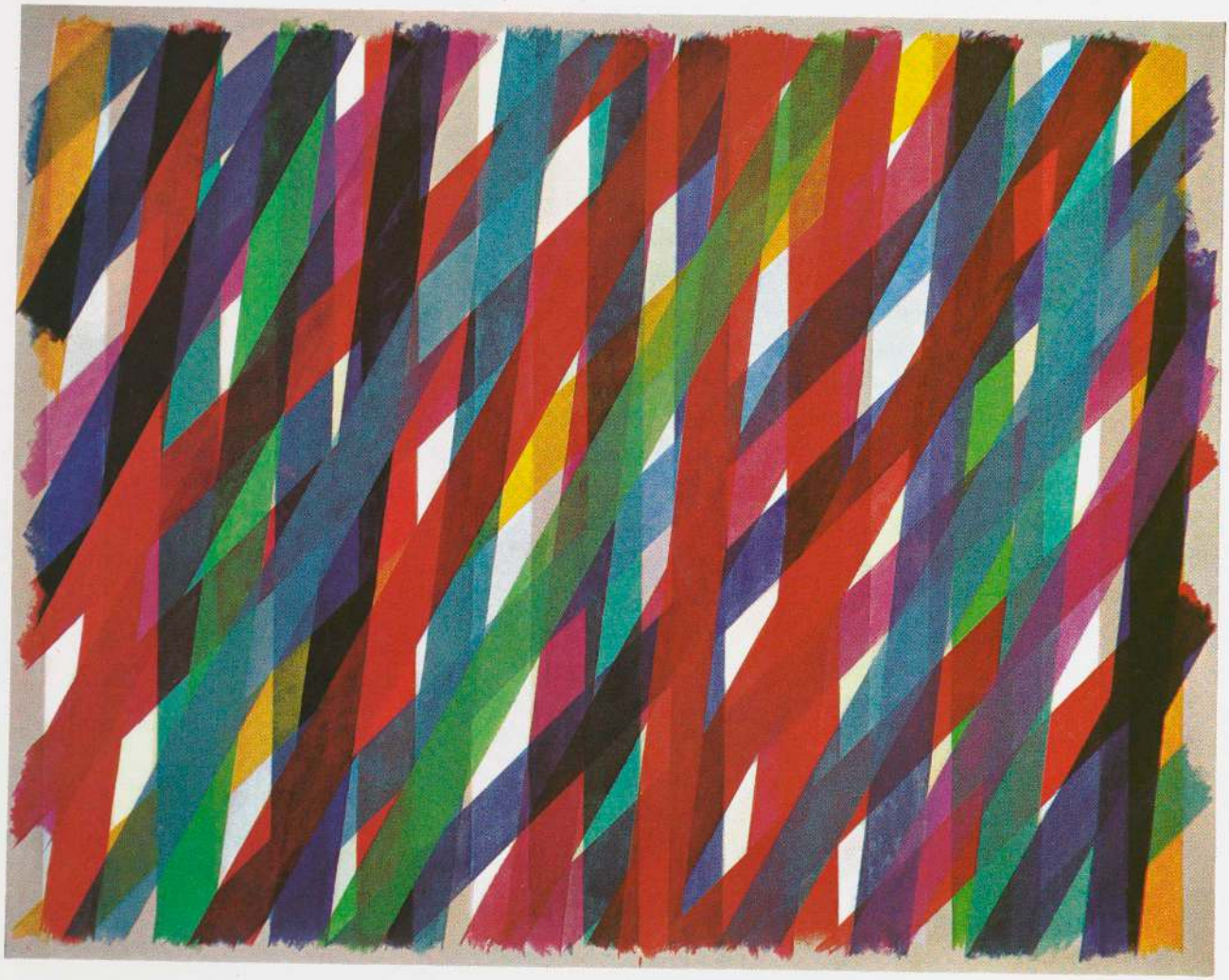
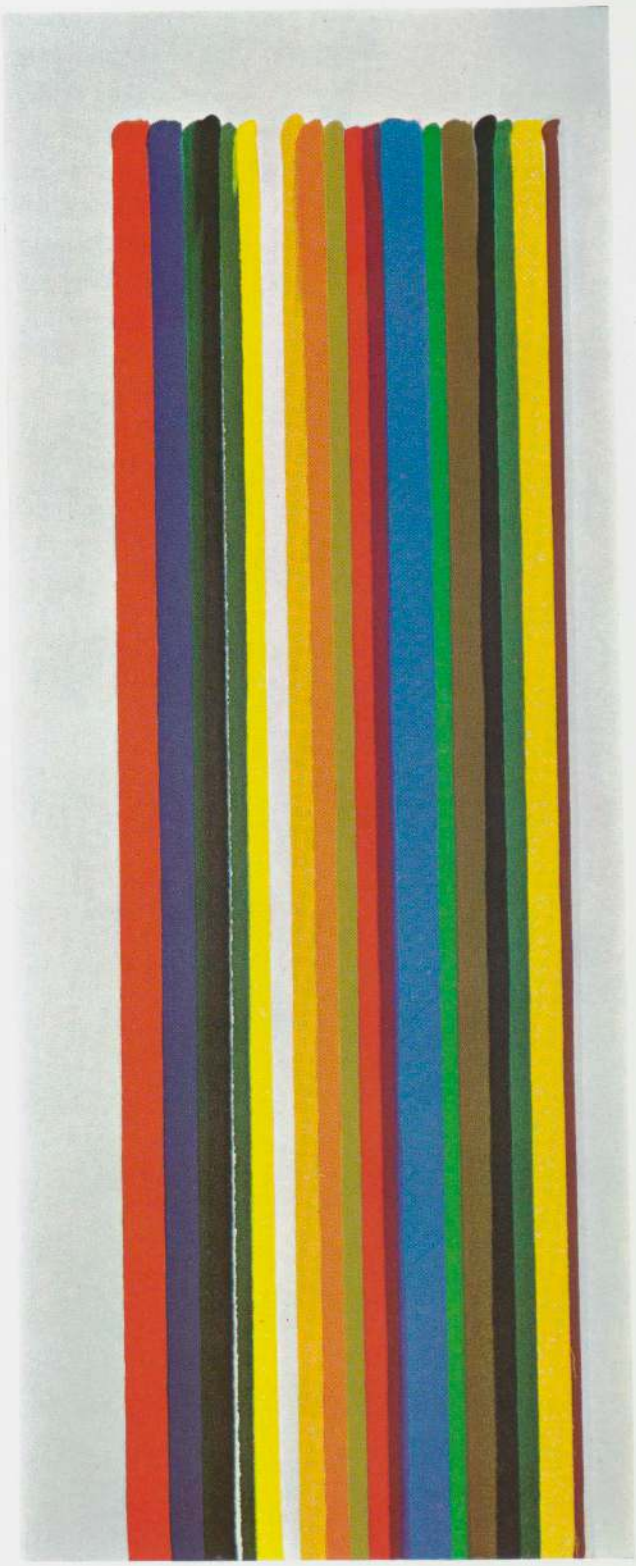


LUDWIG: *Cinematic Painting*. 1964. Oil on composition board, 24⅛ x 48⅛". Owned by the artist



DORAZIO: *Construction Eurasia.* 1964. Oil on canvas, 68 x 96½". Marlborough Galleria d'Arte, Rome



LOUIS: *Number 33*. 1962. Acrylic on canvas, 87¼ x 34⅝″.
Collection Adam and Toby Emmerich, New York

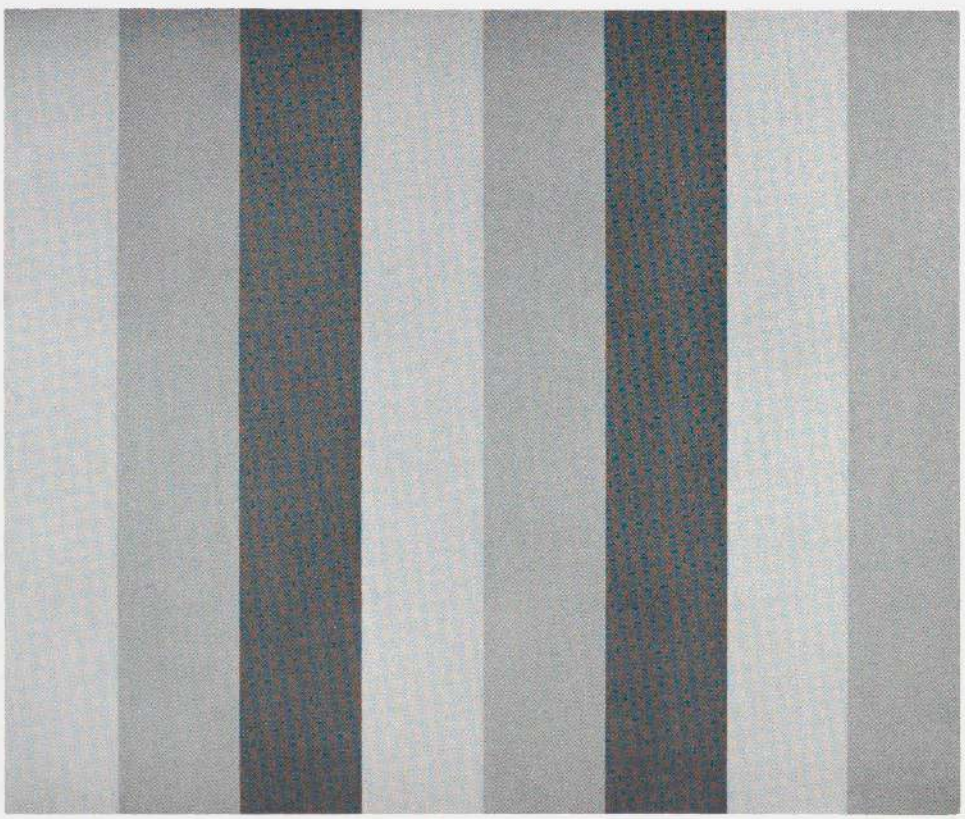
I. THE COLOR IMAGE

Considering that from Altamira to Albers most paintings have been executed in color (just as all art has been in one way or another "perceptual"), The Color Image is a less than adequate heading. Yet these canvases do belong to one family which has been designated as "new" or "post-painterly" abstraction.

pages 10, 11, 12, 13, 14, 44

Each of these artists has his unique development and orientation. In the sequence of exhibition and criticism, however, the tendency initiated by Morris Louis and Kenneth Noland has been seen as an outgrowth of the least expressionistic of the New York School painters—Still, Rothko, Reinhardt, Newman, and Gottlieb—and has perhaps also been affected by the late coloristic paintings and collages of Matisse. Among the European pictures only Piero Dorazio's *Construction Eurasia* seems at home here.

These large heraldic canvases share a dependence on original and striking color juxtaposition, a reduction of shape-vocabulary to the simplest units and combinations, and what Clement Greenberg calls a "clarity and openness" that minimizes the importance of the frame. Because of the thinly applied or soaked pigment, areas of bare canvas, or the visual destruction of flatness by color contrasts, the picture surface—so important to the abstract expressionists—is dematerialized. The color elements, their forms so diagrammatic as to be unobtrusive, are given maximum freedom of operation in every direction.



In contrast to painters of the de Stijl or constructivist traditions or to Albers and Vasarely the color imagists are poetic, even romantic in approach. They are antiprogrammatic: their colors are chosen freely and subjectively with at most a passing thought to scientific or theoretical principles. The bold color images arrest the eye immediately, like billboards, but retain interest because of their beauty, live interaction of color, sensations of advancement or recession, lateral movement, spatial radiation, and subtleties of formal adjustment not at first apparent.

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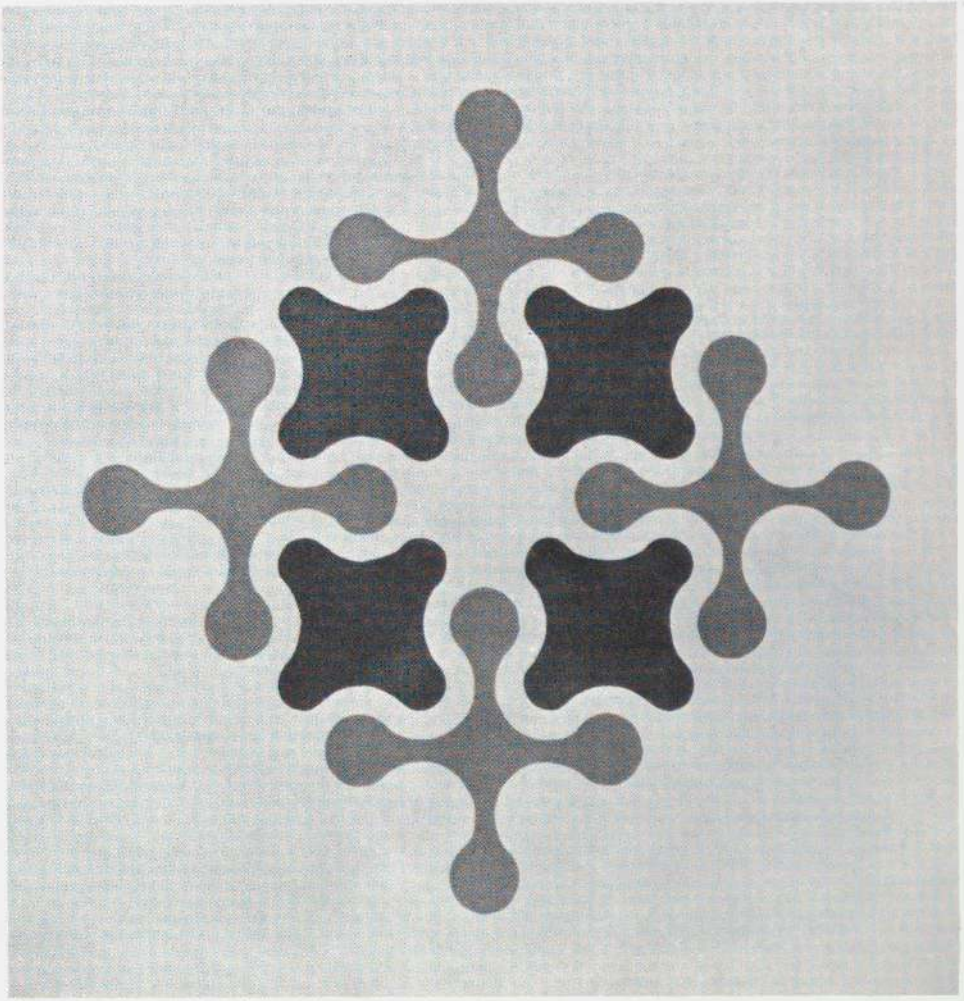
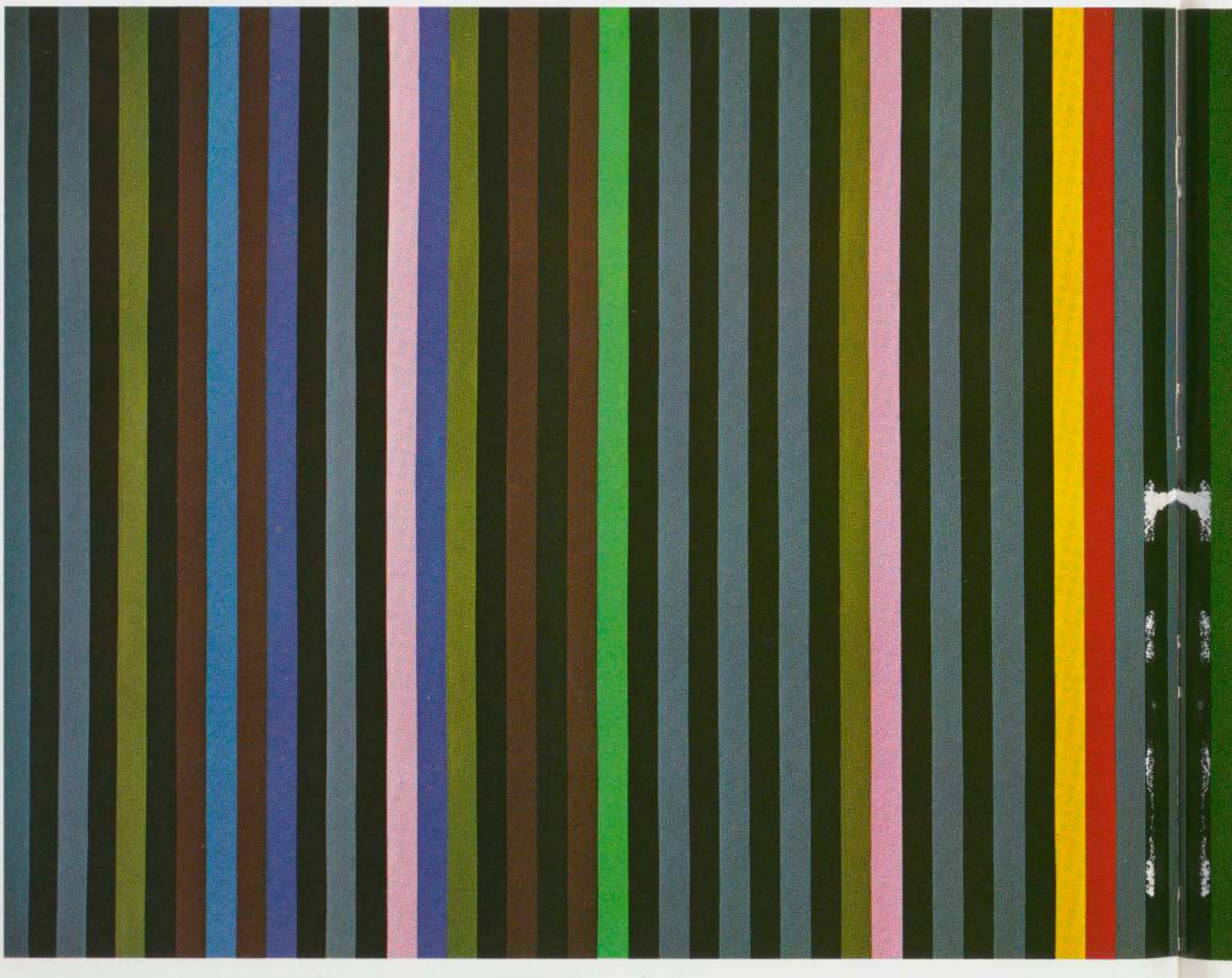
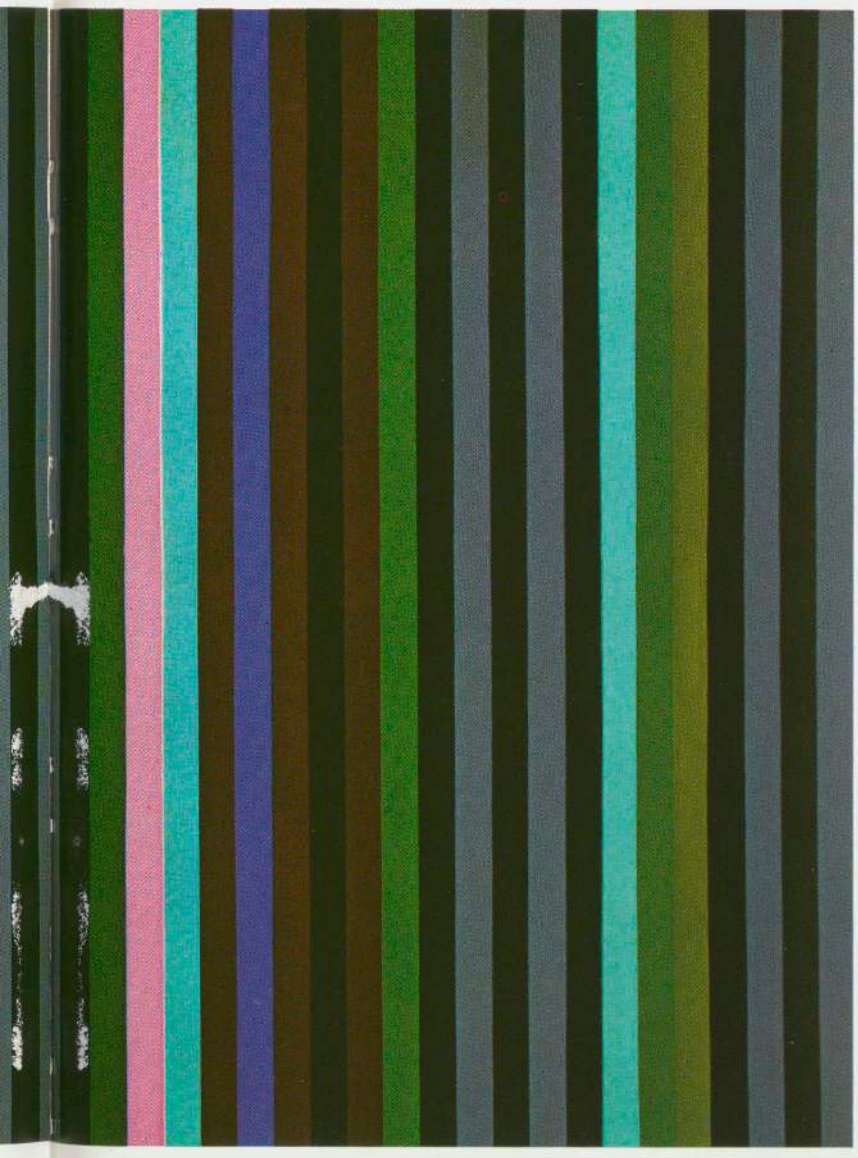


FEELEY: *Alniam*. 1964. Acrylic on canvas, 60 x 60″. Collection Philip C. Johnson, New York

Left: MOLINARI: *Mutation: Verte et Rouge*. 1964. Acrylic on canvas, 6′ 7″ x 8′. East Hampton Gallery, New York



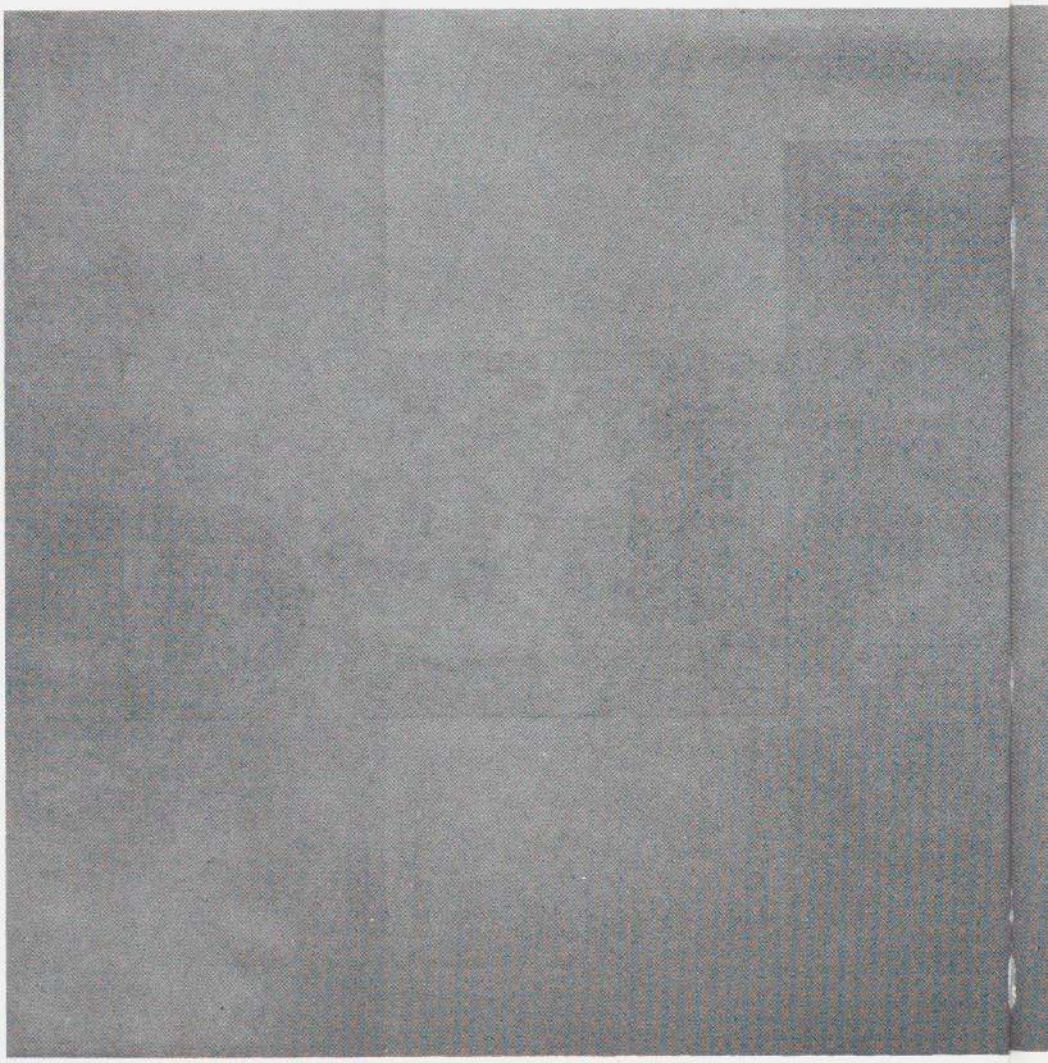


DAVIS: *Black-Gray Beat.* 1964. Acrylic on canvas, 8 x 16′.
Poindexter Gallery, New York

II. "INVISIBLE" PAINTING

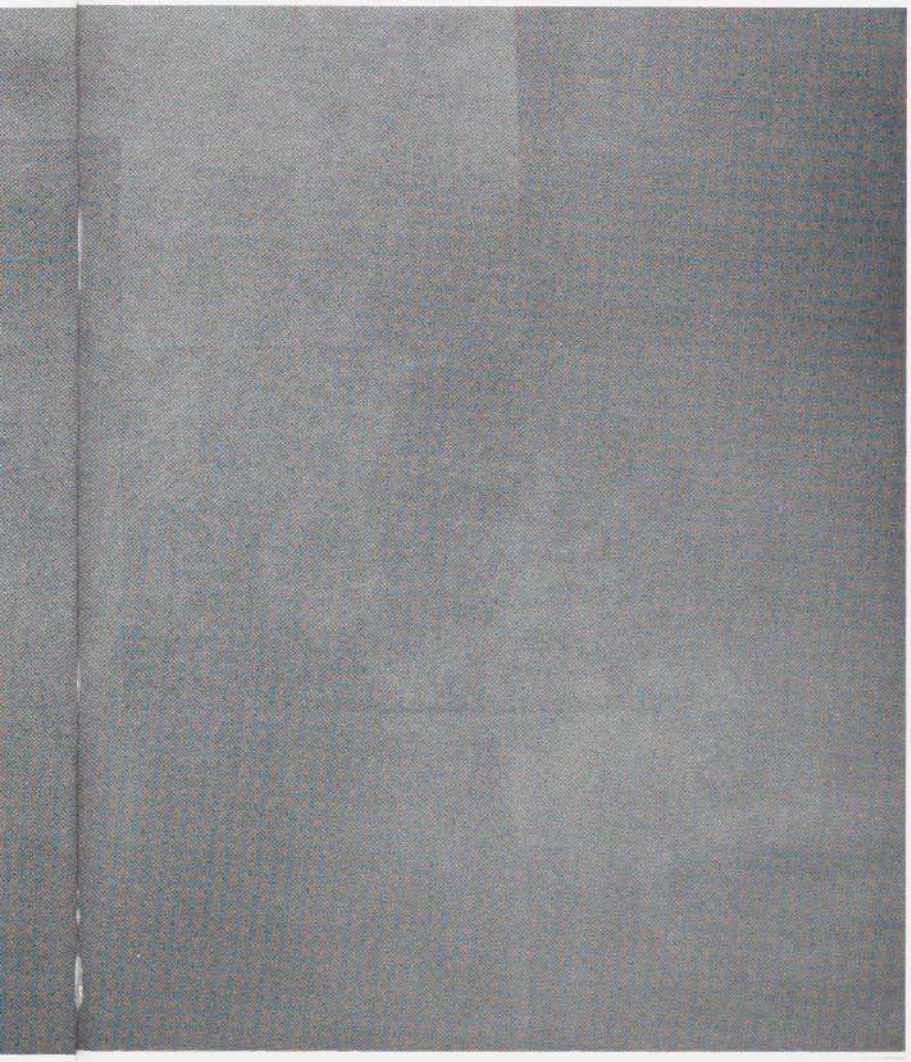
A disinterested, hurried, or inattentive gallery visitor can easily dismiss these "invisible" works as entirely homogeneous, so slight are the differences in tone and color that distinguish their elements and mark the individuality of each artist. "Quietistic" painting, of which Ad Reinhardt was a pioneer, raises a question posed by Leo Steinberg in a commentary on a series of blue pictures by Paul Brach: "How close to all-one can multiplicity come?"

It is wrong, perhaps, to show close-valued paintings in crowded exhibitions, for their viability lies at the threshold of invisibility. Each work should be seen in isolation, for a meditative state of mind, proper lighting, and passage of time are absolutely essen-



tial to a meaningful response. The eyes must accommodate to the painting as they do to a dimly lit room after having been in sunlight or, conversely, as they accommodate to the transition from darkness to bright light. The eyes and the mind must be prepared gradually to approach the acuity of perception and feeling that was possible in the quiet of the studio, and must slowly follow the experiences of depth or encompassment, appearance or disappearance, unity or multiplicity for which the painter provided the conditions.

It is easy to associate these large paintings with religious and mystical states. The contemplation of nothingness, which they invite while retaining their identity, quickly goes beyond purely visual sensation.



REINHARDT: *Red Painting Number 7*. 1952. Oil on canvas, 6′ 4″ x 12′. Betty Parsons Gallery, New York

III. "OPTICAL" PAINTINGS

The tags affixed to art movements and tendencies are seldom precise. Josef Albers objects to the terms "optical" and "retinal" because the responses they denote "are psychological and thus happen behind our retina, where all optics end." Recent experiments have demonstrated, however, that at least some phases of these effects are physiological and photochemical, and take place in the retina. In any case, recognizing its limitations, one accepts the term "optical" only provisionally.

Optical painting such as that of Richard Anuszkiewicz sets itself off rather sharply from the work of the color imagists, notwithstanding the existence of works at the threshold between the two groups. Whether the optical painters work in oils or the new plastic base water paints, their technique is more precise—in fact it is often immaculate.

pages 6, 19, 21, 25, 26-7, 32, 45, 48-9

On a sensory level, if not theoretically, they are always conscious of what Albers calls "the discrepancy between physical fact and psychic effect," a polarity which to him is "the origin of art." Either at school or in their own studios they have learned that no color, and even no shape, has an invariable identity: that a given mixture of pigment can appear lighter or darker, warmer or cooler, brighter or duller; that a line or a shape can appear long or short, large or small, straight or bent, depending on the elements among which it appears.

Theories of pigment mixtures, color, and light can sometimes be helpful to the optical painter but his essential knowledge, as Albers' famous classes in color and design have shown, comes from experimentation, from perceptual experience. No verbalization, however eloquent, can explain the variability of color tones or the astonishing results of their interaction, for color is the most relational and unpredictable of media.

The most intense and dynamic interaction of color takes place between opposed or complementary hues. As Michel-Eugene Chevreul showed in his book *The Principles of Harmony and Contrast of Colors*, first published in 1839, such hues as red and green intensify each other when seen together and induce a complementary aura when seen alone. Today, with a vastly expanded and brightened battery of pigments at his disposal, the painter can work with a palette enlarged by another order of perceptually created images, simultaneous contrasts, after-images and other effects, some of them as dynamic as any produced by physical motion. Hard edges can be made to soften, wave, and fluctuate; flat bands can be modeled perceptually to appear like Doric fluting; and, because of periodic fatigue, or "bleaching" of color-sensitive cones in the retina, luminous shapes, purer and more brilliant than the painted shapes that generate them, can be made to appear, disappear and reappear at another location in a rhythmic cycle. From these aggressive confrontations of hues, to smaller and more numerous units that pulsate with faster rhythms, down to a pointillism that neutralizes opposites rather than intensifying them, an uncatalogued range of possibilities can result from simultaneous contrast and fusion.

The potentialities of optical painting can only be suggested here; complementary oppositions are simply its most dramatic manifestation. Albers, indeed, has always avoided them as a hostile attack on the senses. His famous nests of squares are assembled from softer contrasts and analogies in which the median tones interact subtly with the central and outer areas. The addition of the third, mediating color, its appearance delicately modulated by its neighbors into gaseous transparency, produces a more tranquil mode of interaction.

One wonders why the variability and vital propensities of flat surface colors were harnessed so late in the history of art. There are two reasons: first, the advent of abstract painting was essential to the full liberation of color as an autonomous means; second, extensive experimentation with modern pigments and such materials as colored papers was necessary before a perceptually functional art could develop. Needless to say these properties always existed, even within a more limited range of pigments, but for them to live fully in consciousness *both* poles of their reality—physical fact and psychic effect—must be presented. Whether in the subtlest modulation of a median gray or the contrast of hypersaturated complementaries, a demonstration of the simultaneity of cause and effect is intrinsic to the function of optical art. Finally, these live phenomena, which can be changed by lighting and can be weak or totally absent in color slides or reproductions will vary in quality and effectiveness from observer to observer because, as Laforgue realized, "there do not exist anywhere in the world two eyes identical as organs or faculties."

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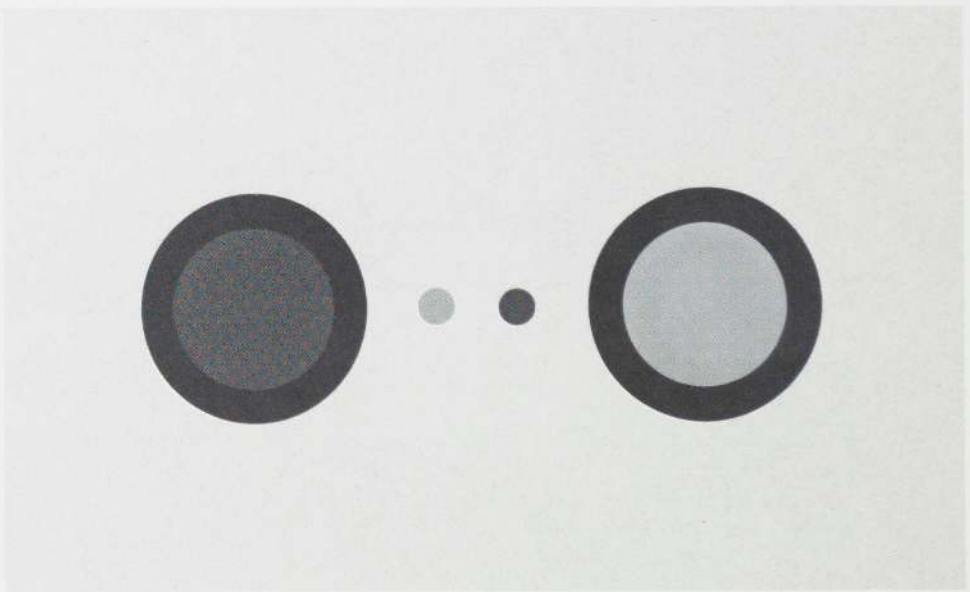
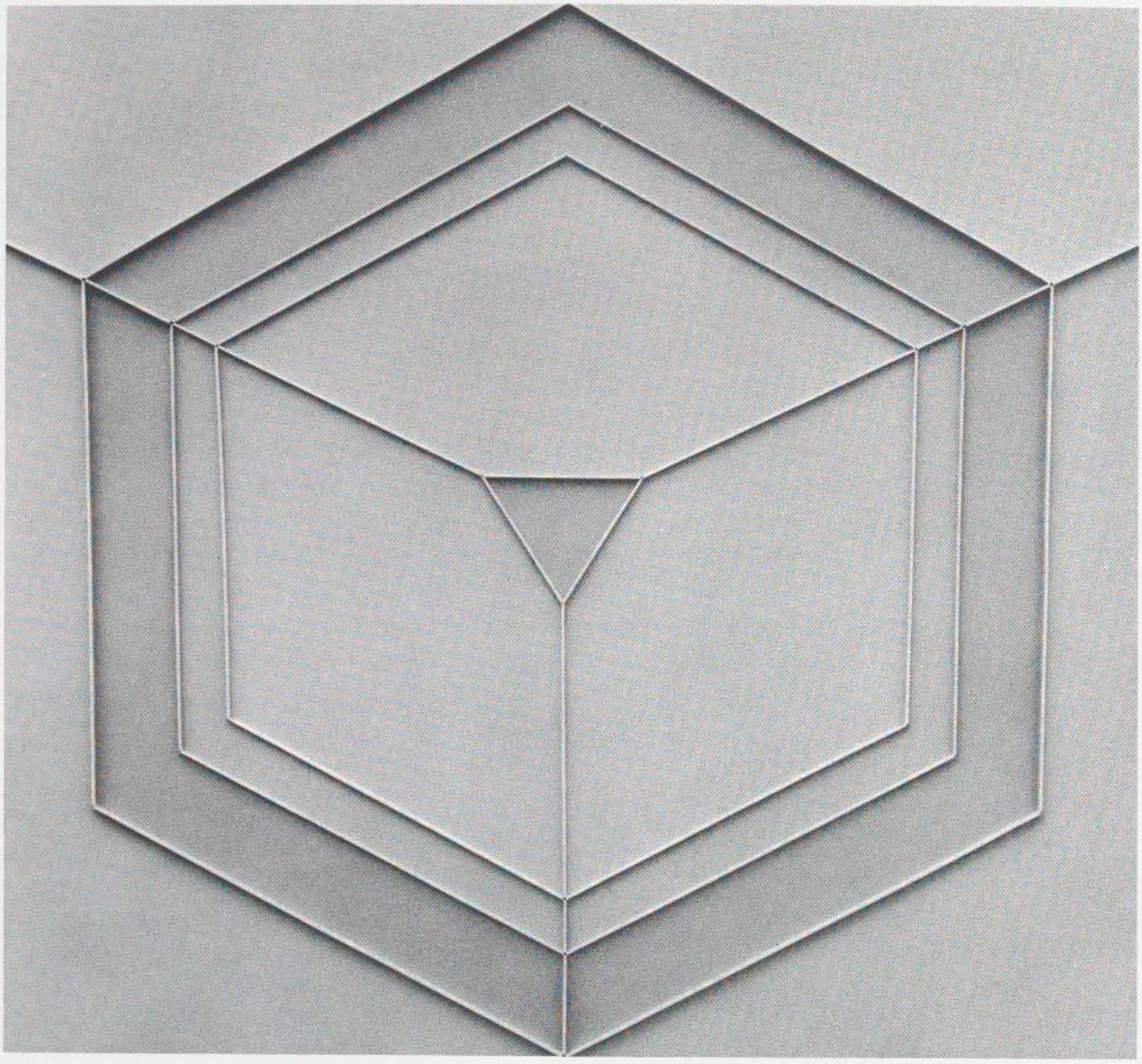
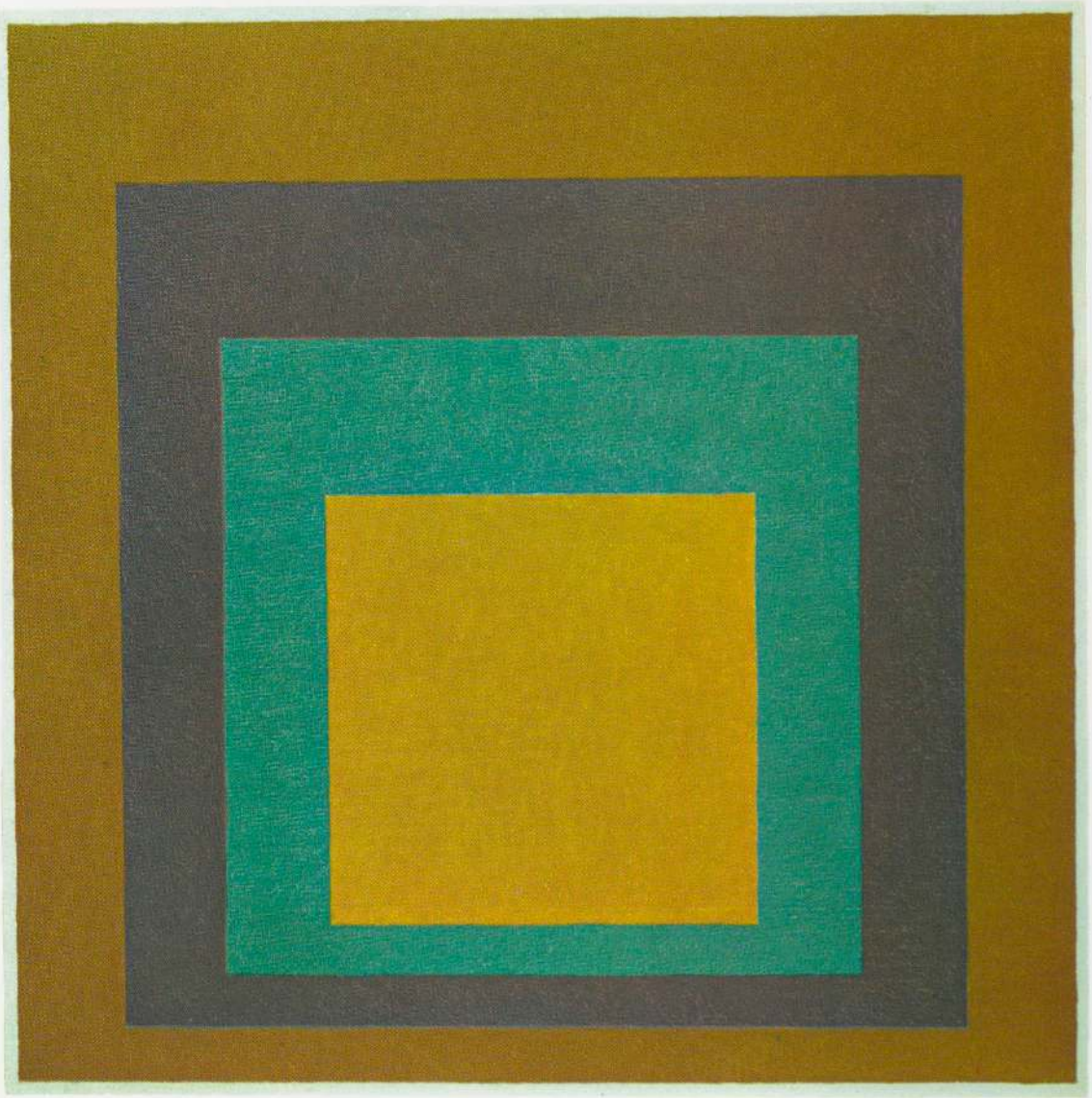


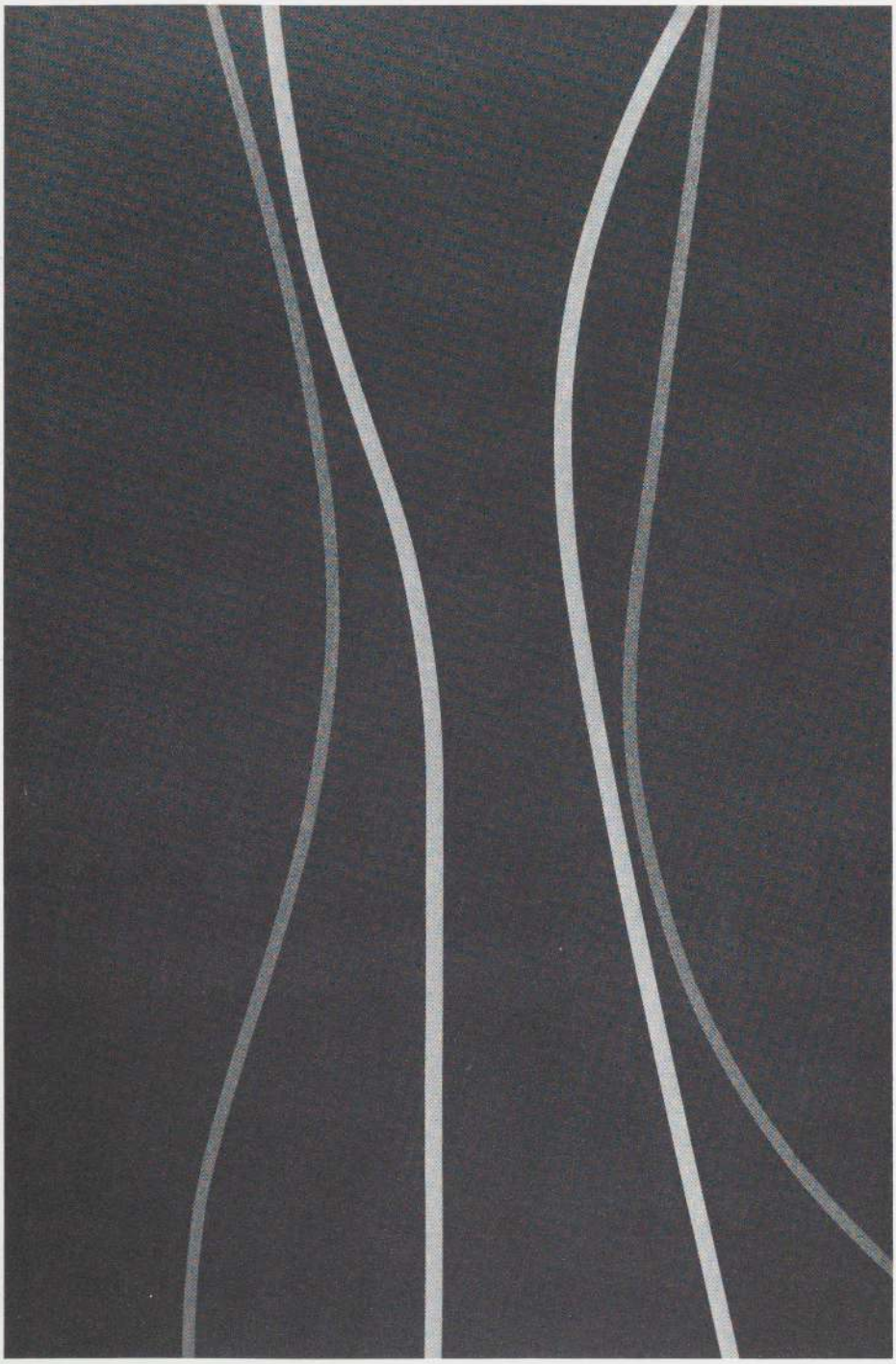
LIBERMAN: *Exchange*. 1952. Oil and enamel on composition board, 21 x 50″. Betty Parsons Gallery, New York



STROUD: *Orange Circumvert with Yellow*. 1964. Compound emulsion on plywood, 55⅛″ x 60¼″.
Marlborough-Gerson Gallery, New York

Right: ALBERS: *Far Off*. 1958. Oil on composition board, 30 x 30″. Sidney Janis Gallery, New York

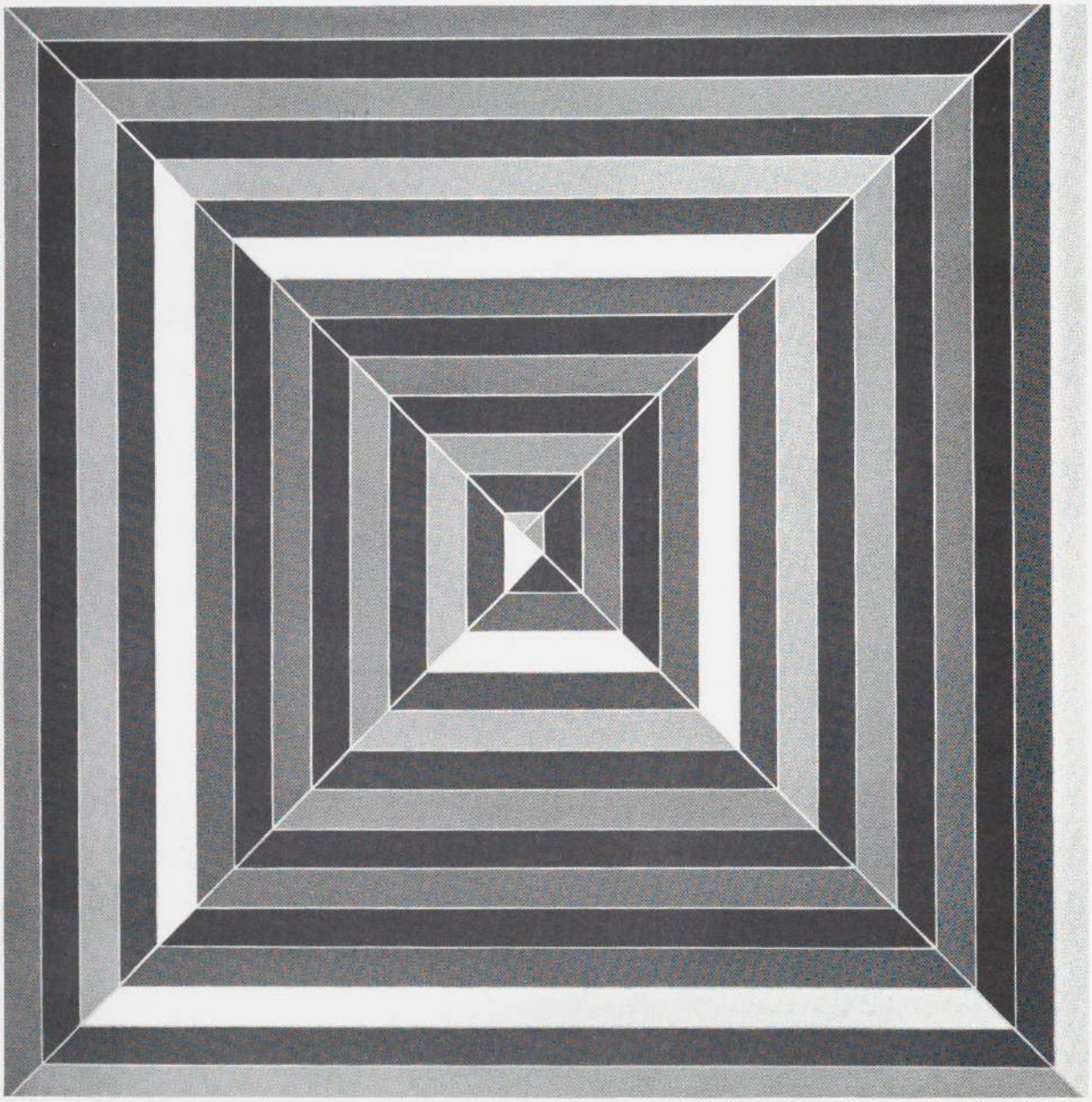




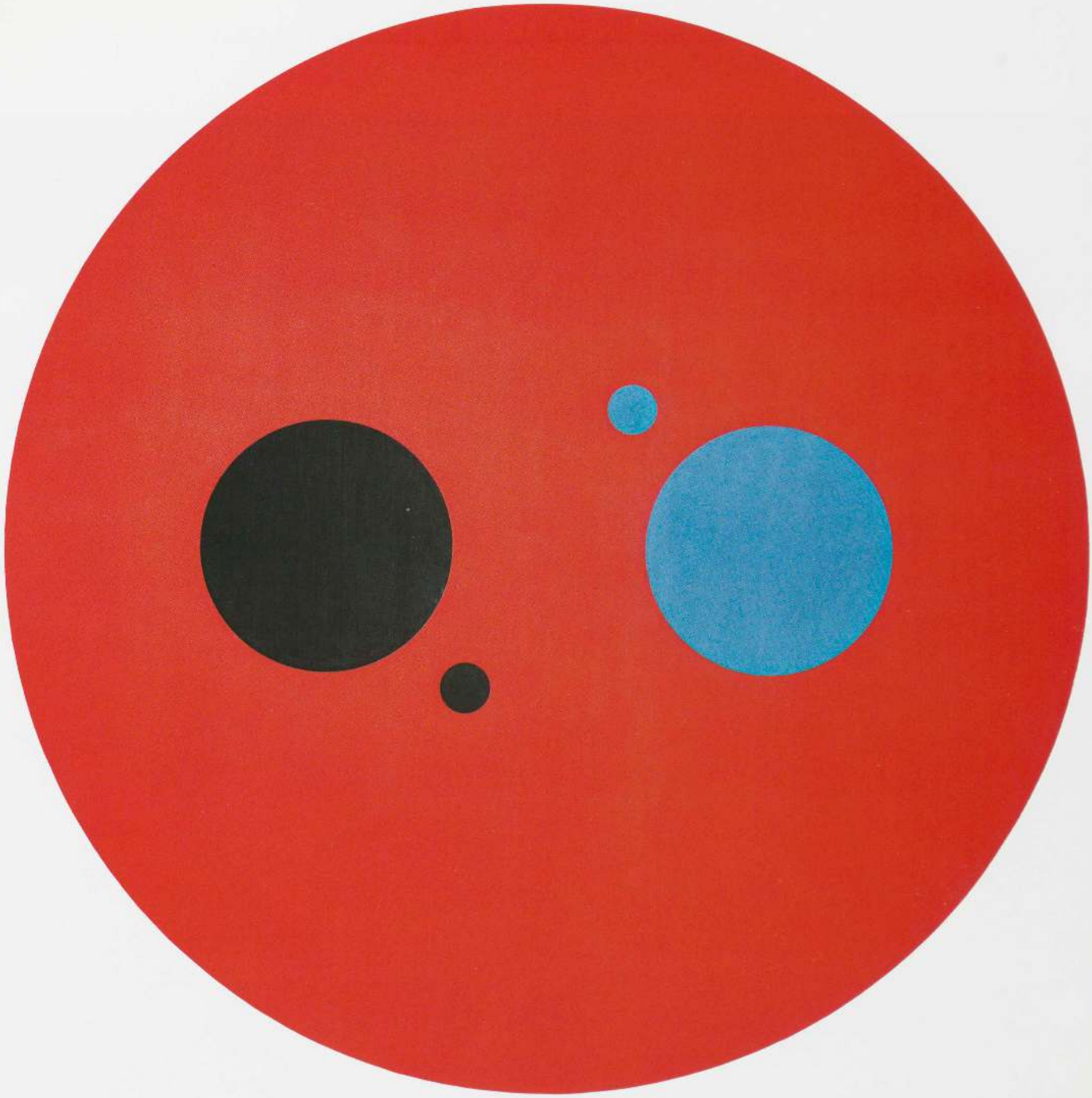
FEITELSON: *Hard-Edge Line Painting*. 1964. Oil and enamel on canvas, 60 x 40″.
Ankrum Gallery, Los Angeles



EQUIPO 57: *PA-18*. 1959. Oil on canvas, 57½ x 44⅞".
Collection Herbert C. Bernard, New York

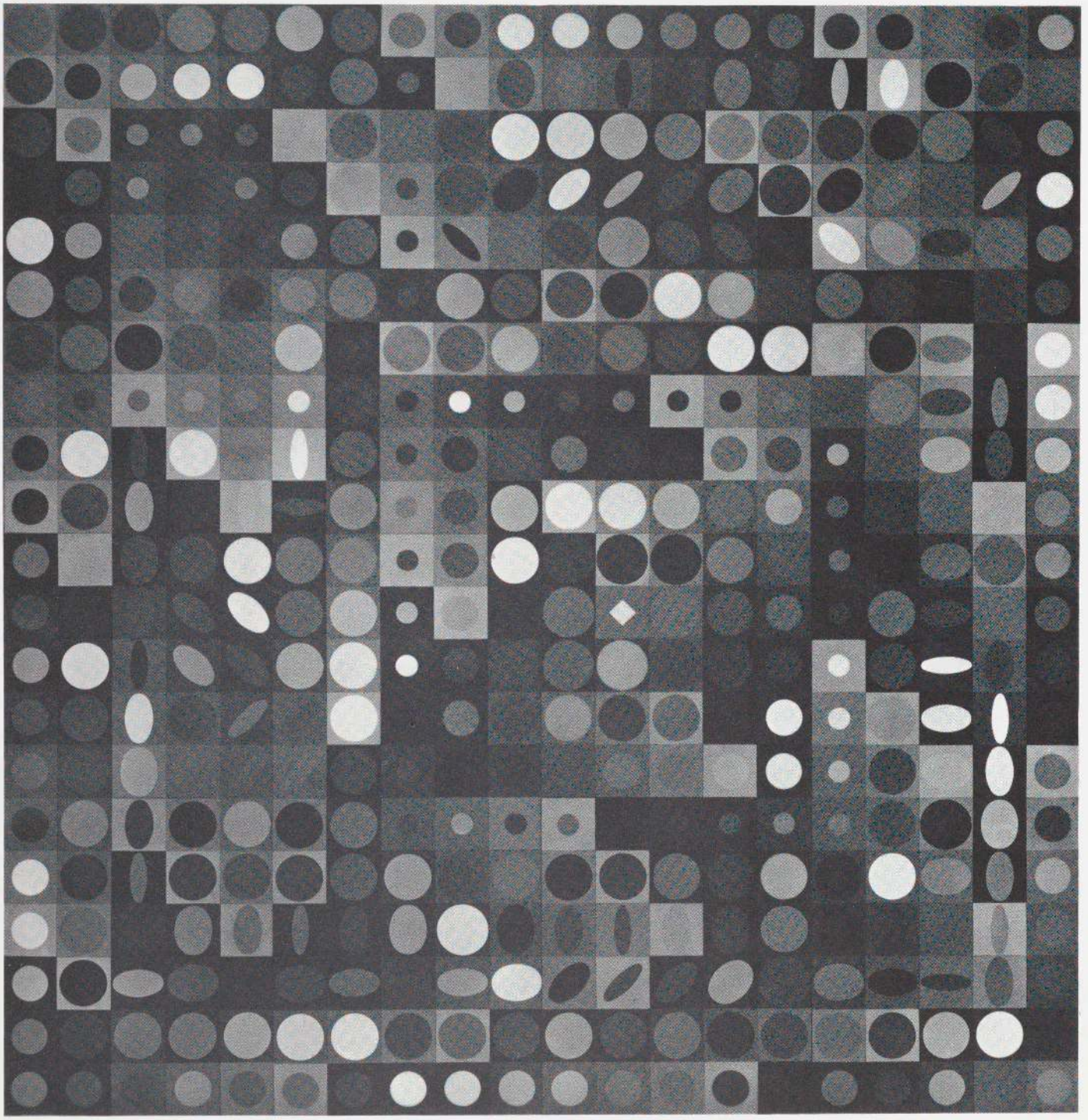


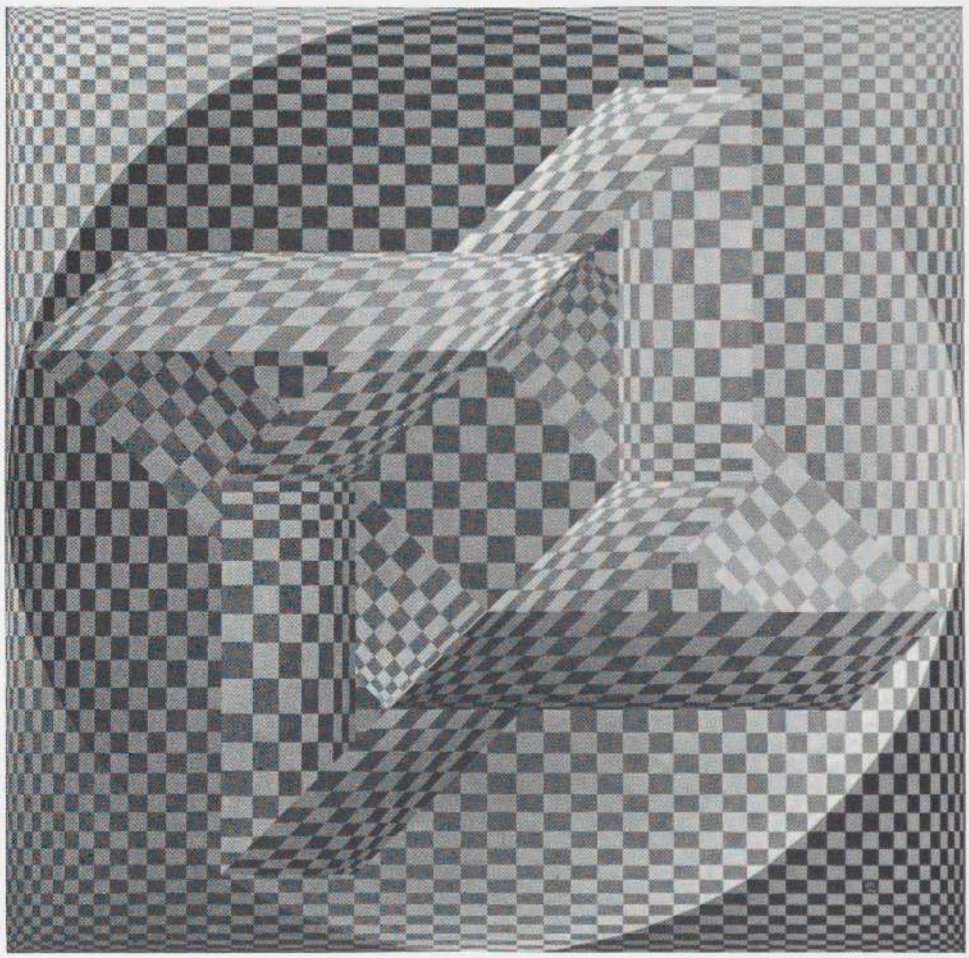
STELLA: *Line Up*. 1962. Oil on canvas, 77 x 77″. The Joseph H. Hirshhorn Collection



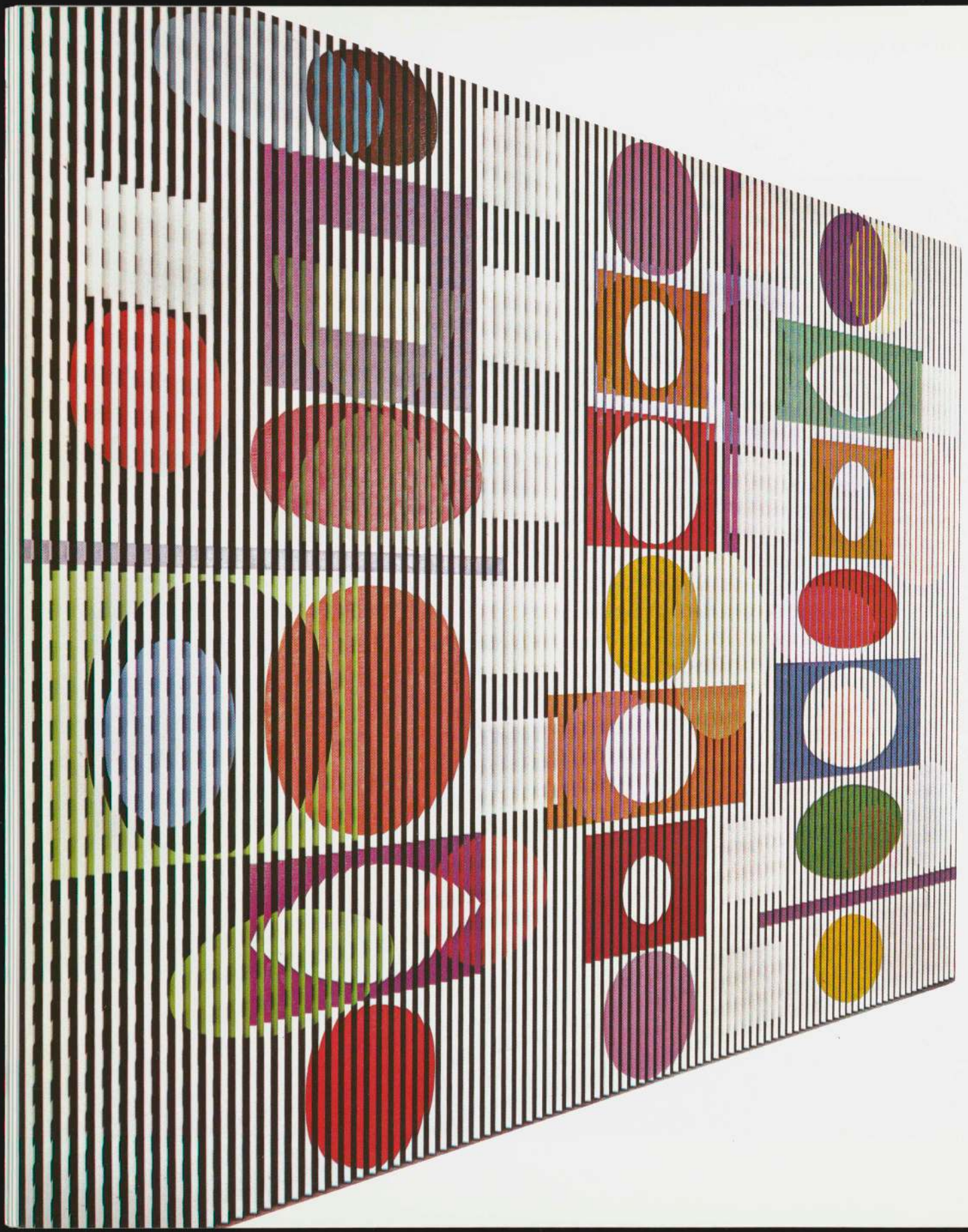
LIBERMAN: *Continuous on Red.* 1960. Oil on circular canvas, 80″ diameter.
The Museum of Modern Art, New York, gift of Mr. and Mrs. Fernand Leval

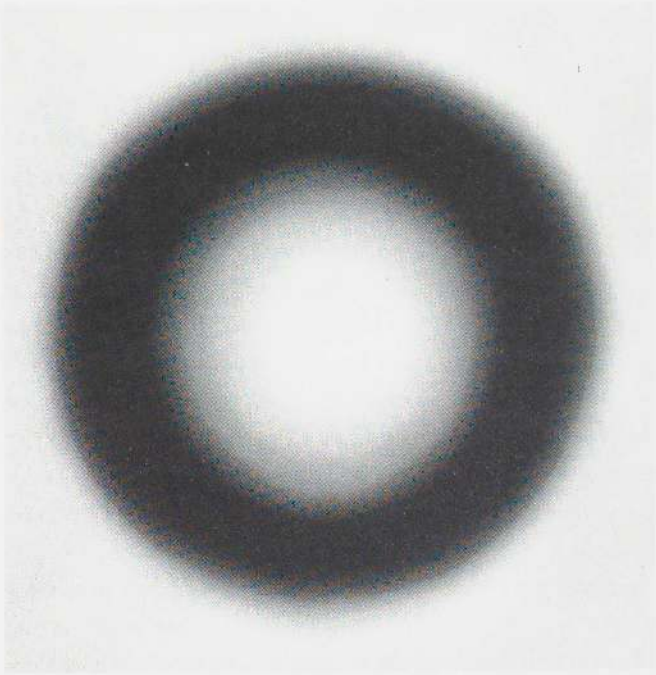
VASARELY: *Orion MC*. 1963. Collage, 6′ 10¾″ x 6′ 6¾″. Galerie Denise René, Paris

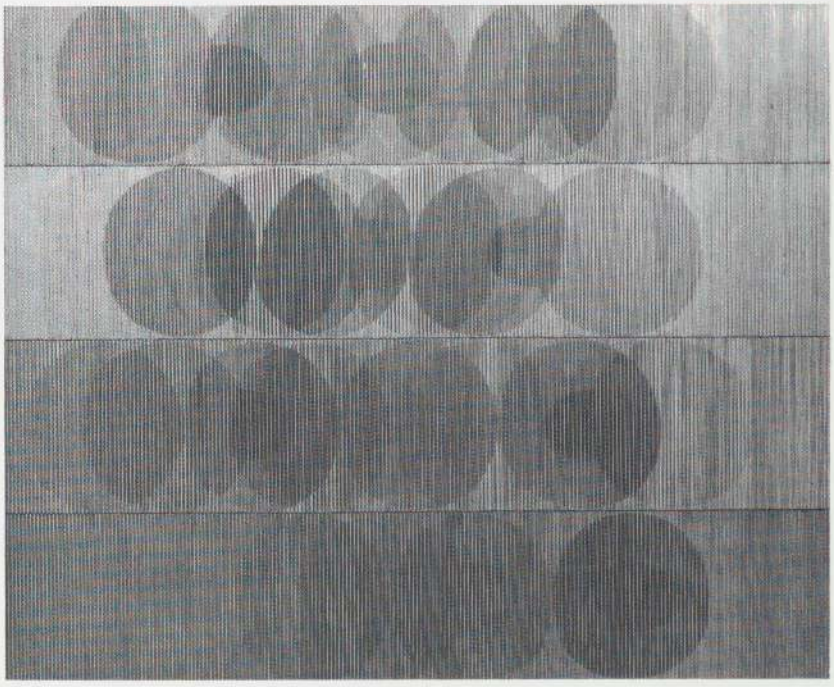




CUNNINGHAM: *Equivocation*. 1964. Acrylic on composition board, 26 x 25½″.
East Hampton Gallery, New York







Above: FANGOR: *Multicolored Target Number 17.* 1963. Oil on canvas, 41⅝ x 41⅝″. Galerie Lambert, Paris

Right: CRUZ-DIEZ: *Physichromie Number 116.* 1964. Transparent plastic on wood panel, 39⅞ x 40¼″. Collection Hans Neumann, Caracas

Left: AGAM: *Double Metamorphosis II.* 1964. Oil on aluminum, 8′ 10″ x 13′. Marlborough-Gerson Gallery, New York

IV. BLACK AND WHITE

Almost everything that can be stated generally about optical painting in color is also true of black and white, and the opposite is also the case. The primary aim from which both result is not beauty of form, tasteful relationships, nor equilibrium in the old sense but the activation of vision. And color is unnecessary for perceptual ambiguity, variability, and movement.

Images rendered in unrelieved black and white can elicit responses at least as startling, if not as numerous, as oppositions of complementary hues, and many works in which color is introduced owe their live effects to essentially black-white or black-white-gray relationships. No stronger evidence of the new level of visual sensibility and the spontaneous international spread of perceptual abstraction could be presented than the recent and quite unprecedented wave of painting without color.

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Two revealing criticisms have been leveled at these works: that they are little more than psychologists' diagrams, and that they resemble projects from classes in graphic design. These objections point out that black-and-white optical painting unites two disciplines formerly outside the fine arts: the research of Gestalt and experimental psychologists that began in the nineteenth century, and the design teaching that began in the German Bauhaus in 1919 and has continued until the present in similar schools in Germany and other countries. It is surely true that psychologists' diagrams (especially the so-called "geometrical optical illusions") and the assignments of progressive design teaching are the most noteworthy precursors of the style. The immediate although not the only source for this spreading school is the art of Vasarely. At the second or third remove he has affected painters who were barely aware of his influence.

Large blocks of black and white interact like complementaries and can almost be thought of as colors. But some of the most effective works employ the uniform patterns of many small geometric units that scientists call "periodic structures." Depending on the size and type of element such patterns can stimulate several responses. If the units are large enough to be clearly separated they relate to each other in a network of connections which the eye, as if seeking for solutions to a puzzle, groups and regroups. By systematically crowding or separating the units, effects of illumination and shade are created as either black or white dominates. Sequential alterations in position, such as a step-by-step rotation of squares in an overall pattern, give an effect of cinematic movement. If, as in certain canvases of Vasarely, a uniform pattern of small circles is changed by replacing some units with ellipses, movement between surface and depth is created, for the ellipses can be perceived either as flat ovals or as progressively tipped disks.

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page 26

If the elements in a periodic structure are extremely small or distant from the eye they merge into a single tone. Although without color this is "optical mixture," the phenomenon on which the pointillist technique of Georges Seurat as well as modern halftone reproduction is based. And it is apparent that some of the most stimulating

effects of movement and illumination occur when, because of sequential changes in the spacing or size of units or because of adjustments in viewing position, clear separations begin to merge in a common tone, either light or dark. When these effects appear in certain linear and radial figures, the impression of brightness and pulsation can reach a startling intensity. The eyes seem to be bombarded with pure energy, as they are by Bridget Riley's *Current*. Even effects of color can result—usually pale pink, gold, or blue. These are increased, Gerald Oster has determined, under the influence of the drugs mescaline and LSD.

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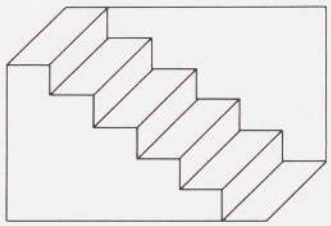
Focal linear perspective was not systematized until early in the fifteenth century, but straight diagonal lines, especially in frescoes representing architecture and in decorative pavements, were already common indications of recession by the Hellenistic period. The spatially reversible geometric patterns in Roman floor mosaics, indeed, are closer to perceptual abstraction in method and effect than almost any other early images. Ambiguous perspective figures such as Schröder's "reversible staircase" are among the best known of visual illusions. As is the case when an ellipse is read as a circle tipped into depth, it is difficult to determine whether the appearance of recession brought about by isometric figures is innate in vision or is conditioned by long habits of seeing.



Both isometric and focal perspective are employed in perceptual abstraction, although the latter must be contradicted or distorted to give ambiguity. Among the best-known examples of isometrics are Albers' engravings in white on black-coated plastic, in which geometric figures simultaneously recede, advance, and remain flat, miraculously twisting straight-edged planes beyond rationalization.

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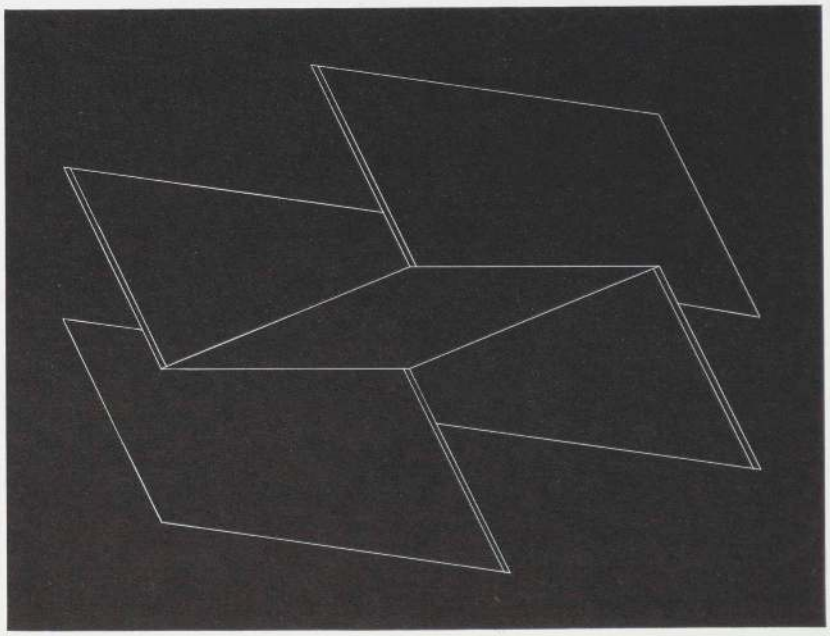
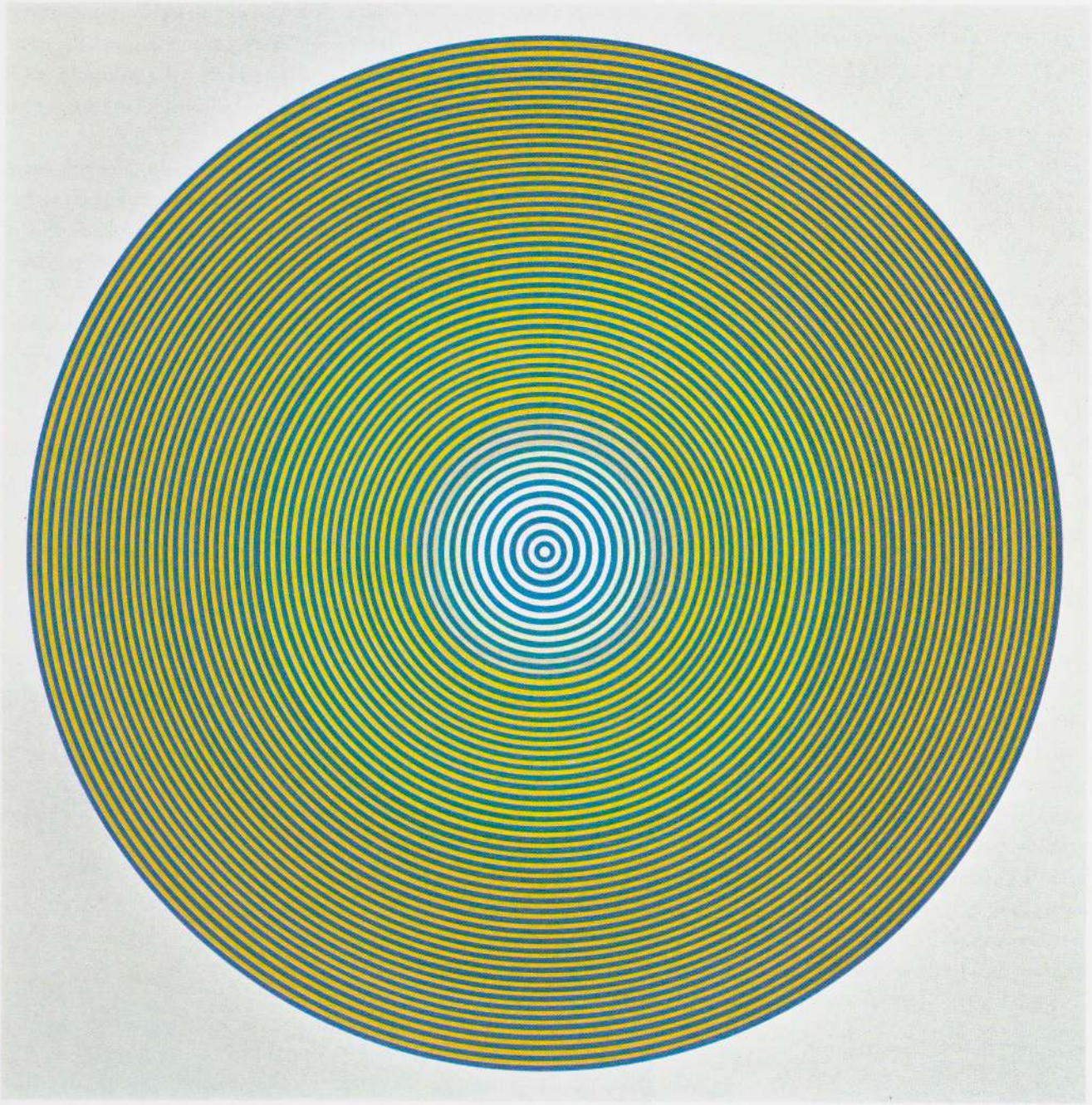
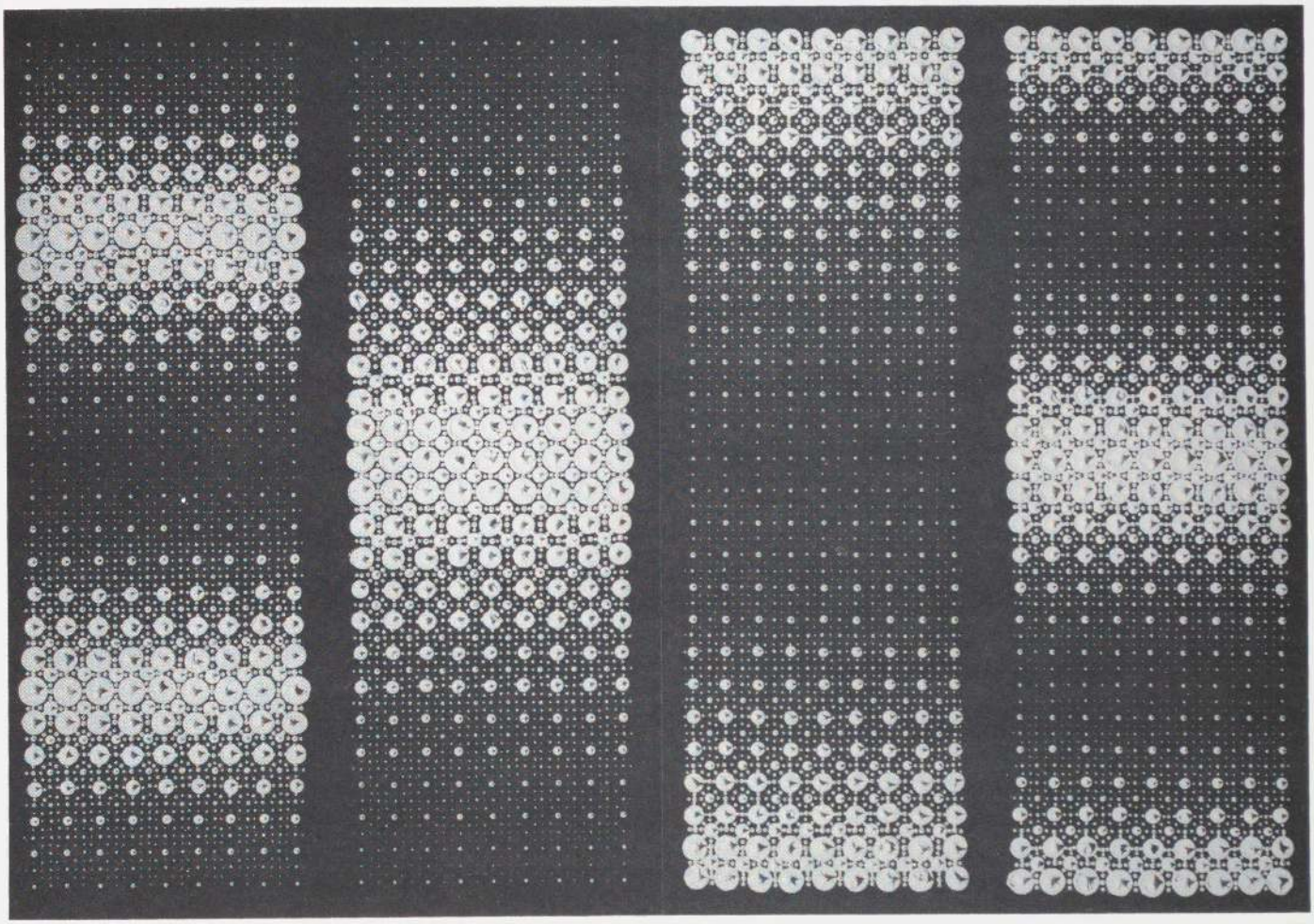


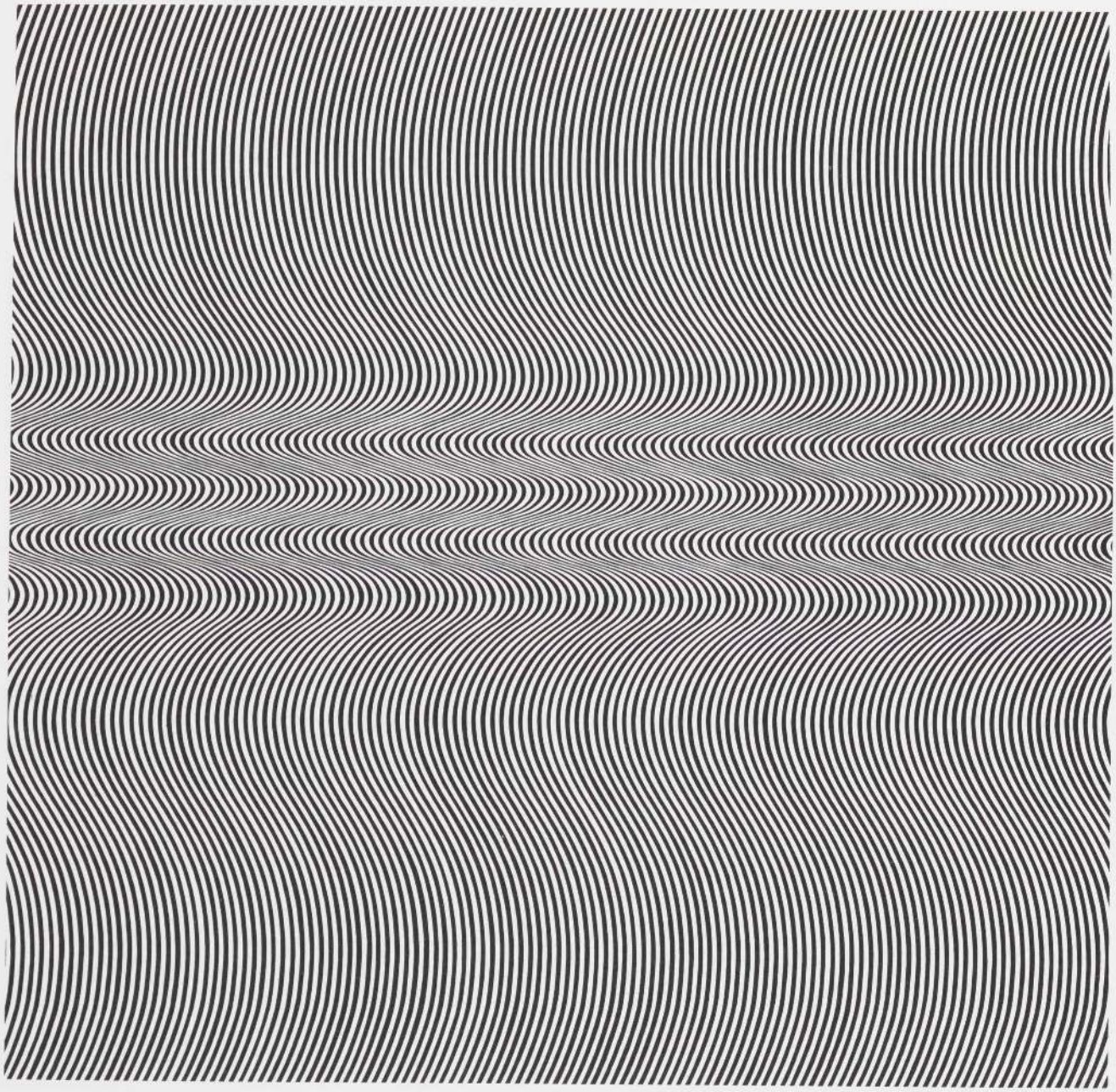
ALBERS: *JHC II*. 1963. Engraving on plastic, 20 x 26″. Collection Mr. and Mrs. James H. Clark, Dallas



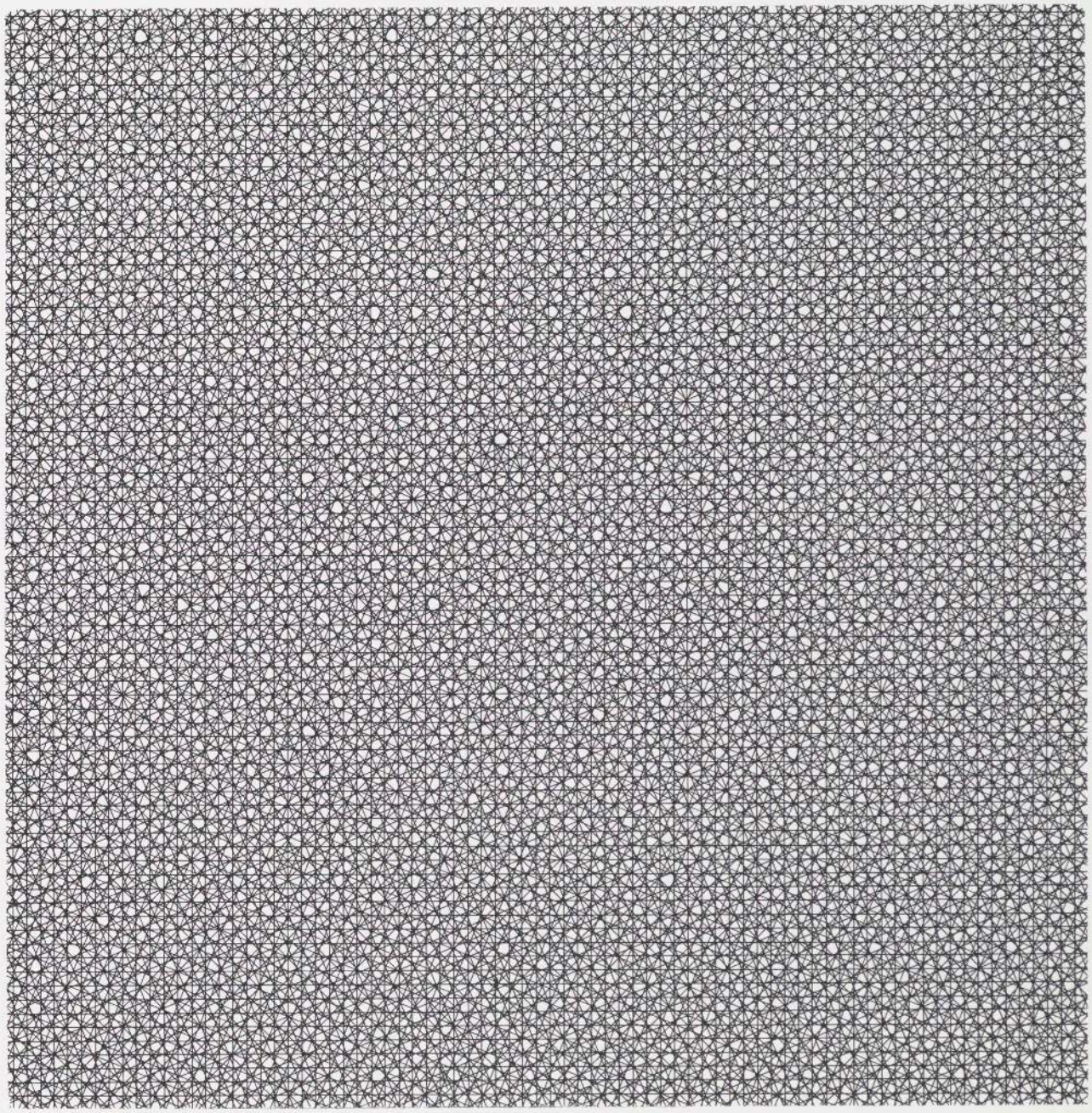


MAVIGNIER: *Concave-Convex Planes.* 1963. Oil on canvas, 55⅛ x 78¾″. Owned by the artist

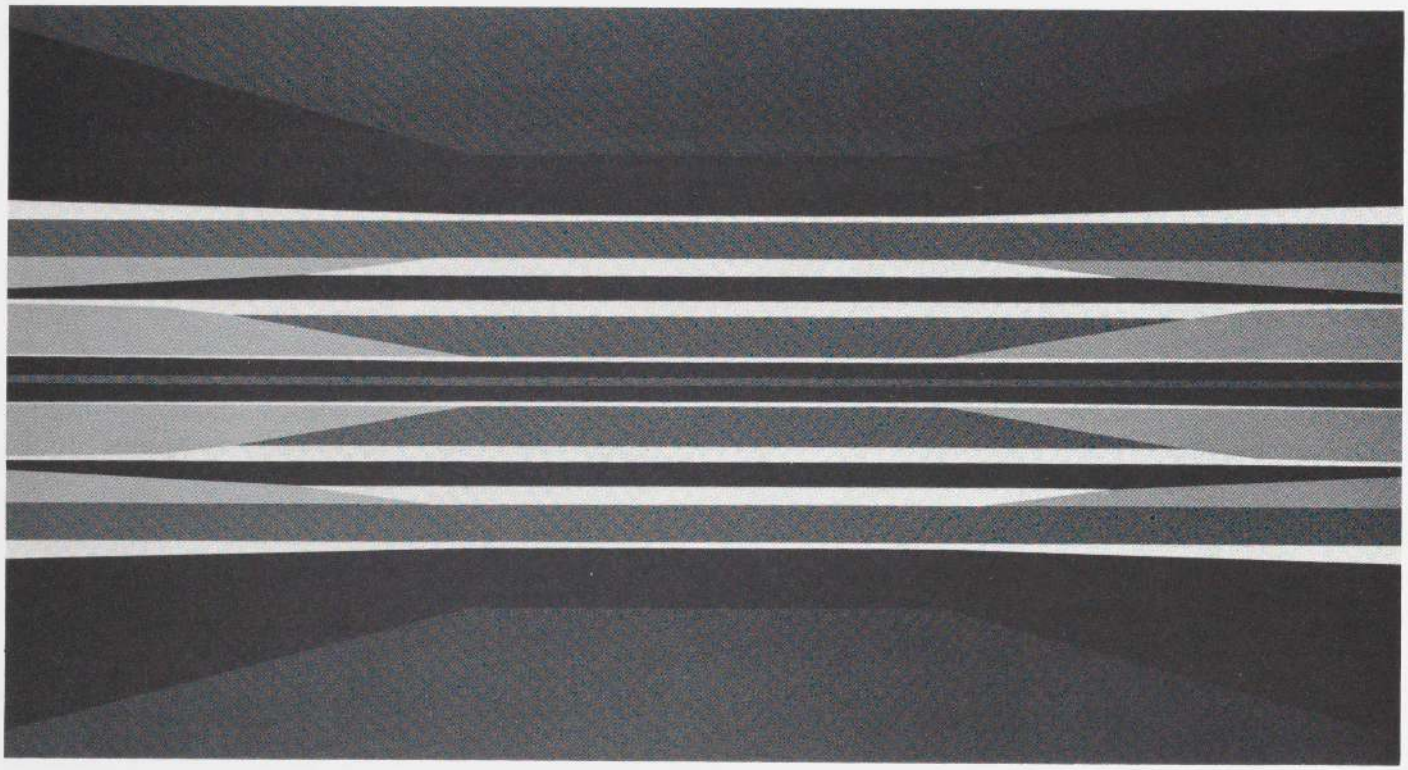
Left: TADASKY: *A-101.* 1964. Oil on canvas, 52 x 52″. The Museum of Modern Art, New York, Larry Aldrich Foundation Fund



RILEY: *Current*. 1964. Emulsion on composition board, 58⅜ x 58⅞″. The Museum of Modern Art, New York, Philip C. Johnson Fund



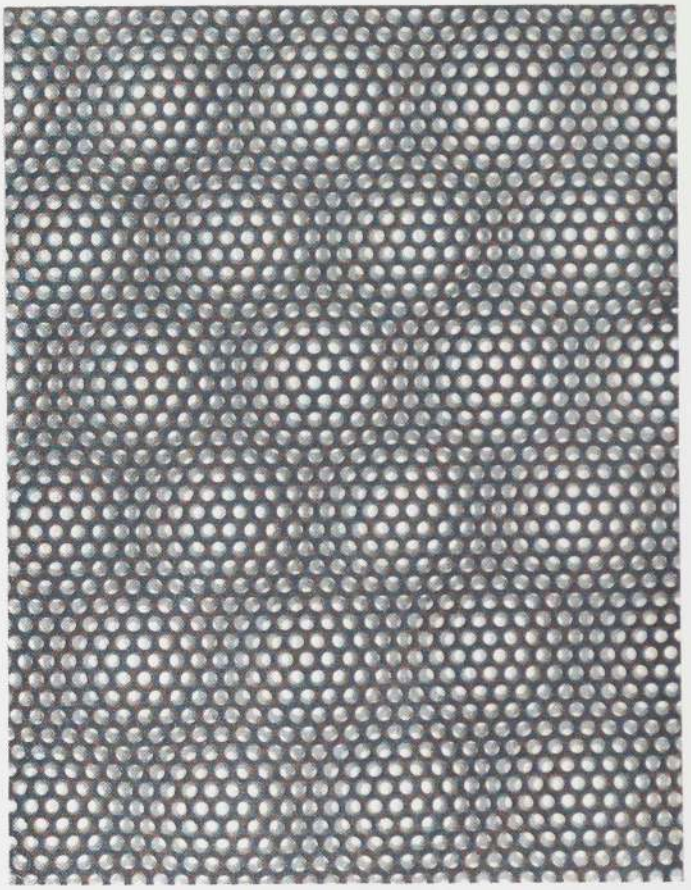
MORELLET: *Screen Painting: 0°, 22°5, 45°, 67°5.* 1958. Oil canvas, 55⅛ x 55⅛″. Galerie Denise René, Paris

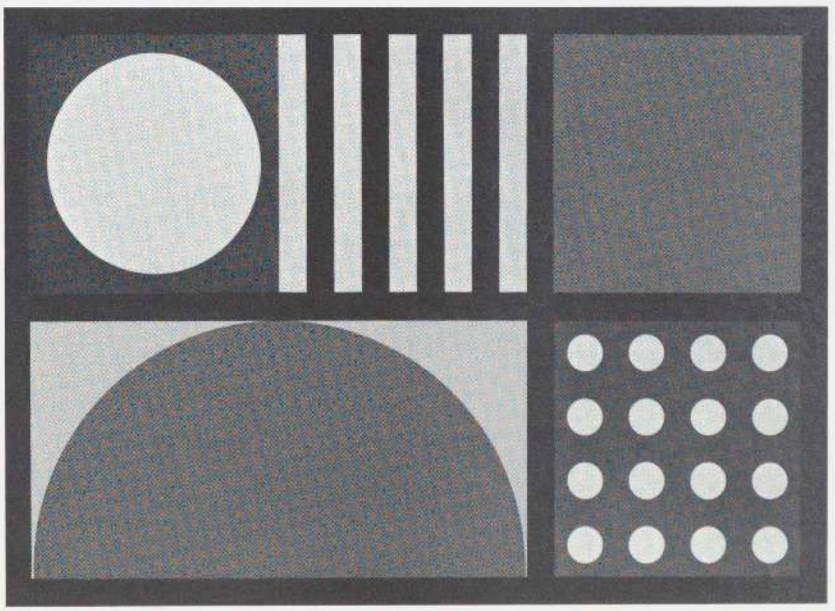


Left: CELENTANO: *Lavender Creed.* 1964. Acrylic on canvas, 52 x 96″. Howard Wise Gallery, New York

Below: BERLEWI: *Mechano-Faktur: Construction in Six Squares.* 1963. Tempera on board, 26⅜ x 37½″. Owned by the artist

Right: STEIN: *Optical Variations on Metal Screening.* 1964. Metal on wood, 39⅜ x 39⅜″. Galerie Denise René, Paris





V. MOIRE PATTERN

The most dramatic demonstration of the dynamic potentialities of line structures is known as "moiré," from the French for watered silk, made by calendering two rolls of finely striated silk face to face, thus embossing one set of lines on the other in a slightly off-parallel relationship. The result is a series of curved patterns, like reflections or wood grain, called "moiré fringes." These can be seen in motion when looking through the folds of thin curtains or through the overlapped center of an adjustable window screen.

When two or more sets of parallel lines, concentric circles, or other periodic structures are superimposed, whether by transparency or other means, an orderly set of "fringes" is produced that varies according to the types of structures combined. Mysteriously, these fringes can act as a microscope, magnifying the open areas.

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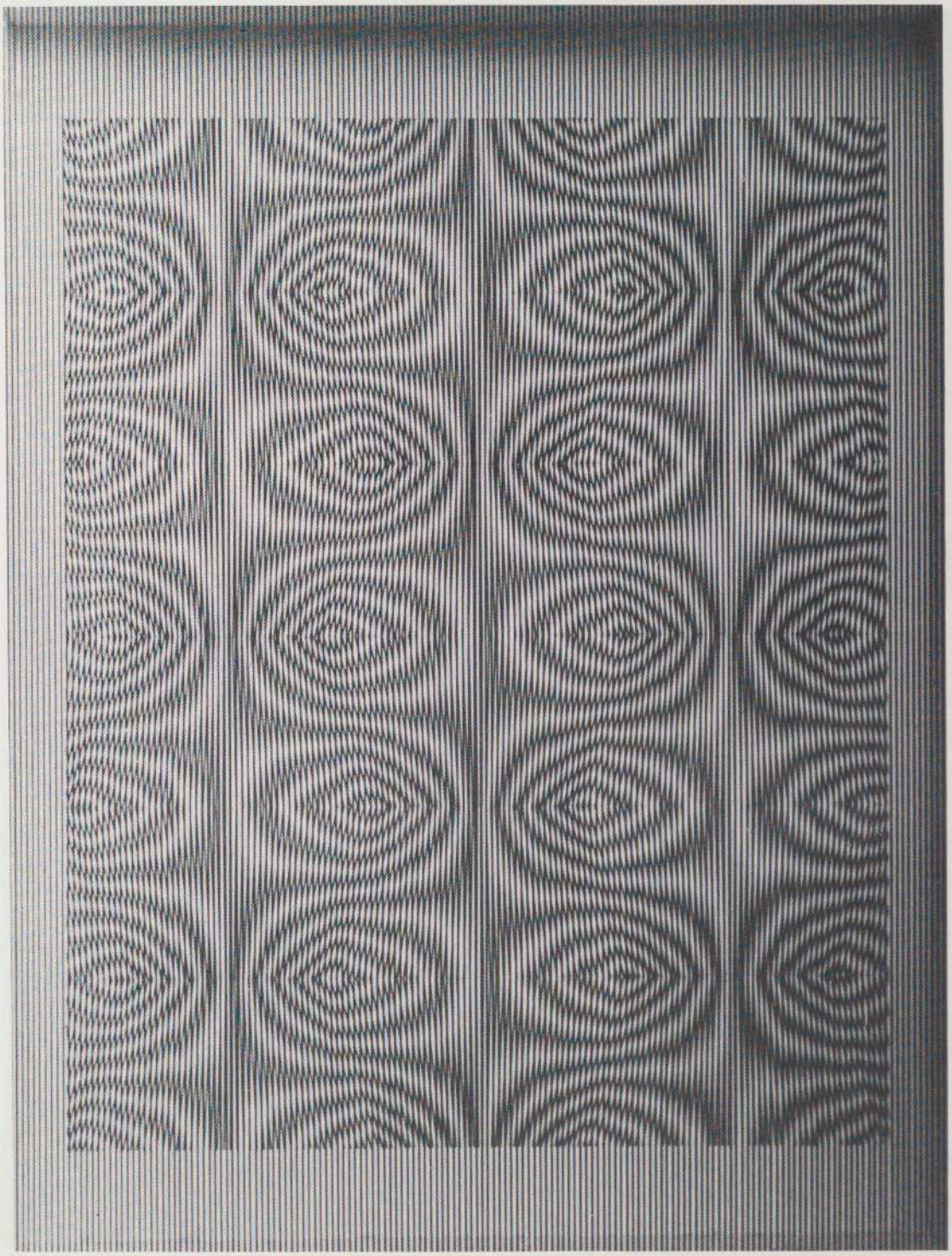
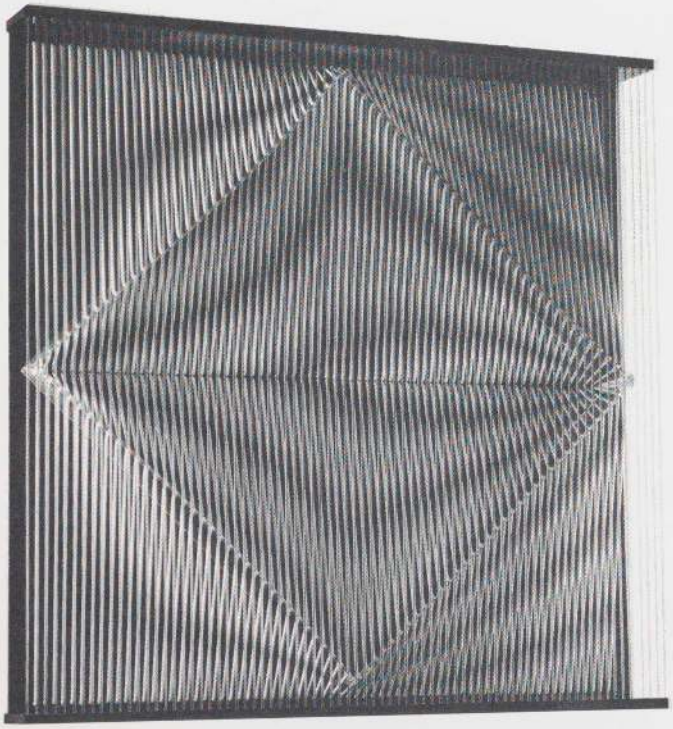
Moiré patterns have been known for many years, but investigation of their immense potentialities is now for the first time being intensively studied by both artists and scientists. The psychological causes of these beautiful and complex perceptual forms are still largely unexplained. To some degree they result from simultaneous contrast and the extension of black-and-white units by overlapping. The most important unitary phenomenon, however, underlies many of the classic visual illusions and is perfectly demonstrated by the work of J. R. Soto. It occurs whenever two lines cross at an angle of about thirty degrees or less: in perception they break at the intersection, widening the smaller angles so that the continuity of both lines is broken. At the same time, if the angle is small enough, its apex clots with black, much as if two wet ink lines had bled into each other. What takes place seems to be a tiny instance of optical mixture. Gerald Oster, the most intensive investigator of moiré patterns, calls attention to the conspicuousness of these intersections: "the lines appear pinched as though two wires had been twisted around each other. The effect is enhanced when the intersection is viewed in red light, diminished in blue light. Evidently the eye is unable to resolve the intersection. When many parallel lines cross, as in the case of two overlapped grids, the eye unconsciously searches the field and ties together these preferred points of intersection."

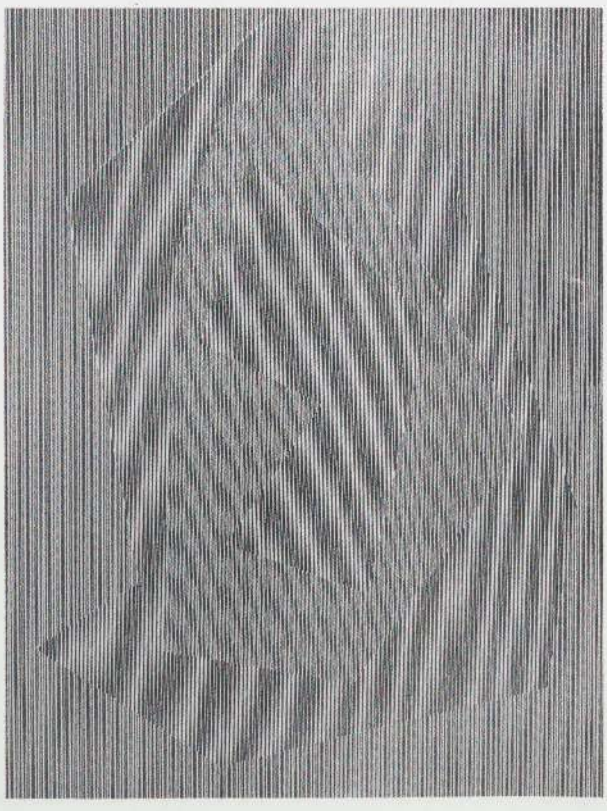
Right: WILDING: *Kinetic Structure 5-63*. 1963. Painted wood and glass, 33⅞ x 26 x 3¼". Owned by the artist





Left: YVARAL: *Acceleration Number 19, Series B.* 1962. Plastic and wood, 23⅞ x 24⅜ x 3⅛". The Museum of Modern Art, New York, gift of Philip C. Johnson

Below: LEVINSON: *Black Moving Planes XIX.* 1964. Plexiglas, acetate and paper, 30 x 21⅞". Kornblee Gallery, New York



VI. RELIEFS AND CONSTRUCTIONS

Although Picasso was the most important originator of construction as a technique for sculpture, it was the Russian constructivists Tatlin, Gabo, and Pevsner who made it a major direction of abstract art. It is not surprising, therefore, that perceptual constructions evolved out of the constructivist tradition just as, in Europe at least, perceptual painting evolved out of geometric abstraction. Nevertheless an all-important difference in means and intent distinguishes the objects in this exhibition from constructivist sculpture: constructivism directs the mind to structure, architecture, and engineering, whereas these works simply multiply and compound the visual means discussed above. The constructions, as it were, are paintings doubled or squared. Painted shapes and lines are augmented or replaced by shadows and highlights from projections and depressions, multi-

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planed patterns, and alteration and multiplication by lenses, mirrors, and reflective surfaces.

Although certain works in this exhibition include elements hung from above involving slight internal motion, fully kinetic sculpture is not shown. Perceptual viability, not physical movement, is at issue whether it results from internal variation or change in viewpoint. Nevertheless the most real and important distinction that separates reliefs from paintings is the incorporation of spectator movement. Soto's dynamic "Vibra-

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tions," the serrated paintings by Yaakov Agam, and the reliefs in plastic, wood, glass, and metal by Yvaral and other artists would not be alive for an immobile spectator. And for double or multi-planed transparencies, especially those employing the moiré principle, the changes in alignment that result from changes in viewpoint are essential.

The principles operative in the paintings and reliefs do not alter, moreover, for free-standing volumes, constructions in plastic and metal, and nests of transparencies. This is an art of appearance, not factuality. Like the apparatus of a stage magician these objects do not exist for their true physical form but for their impact on perception.

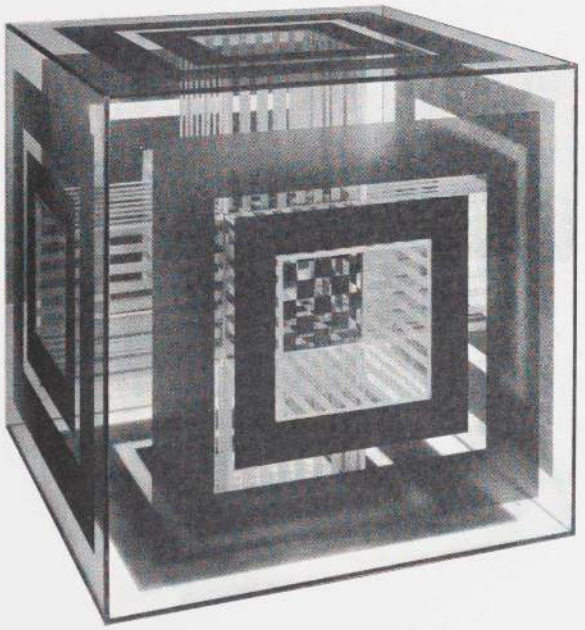
The intent of *The Responsive Eye*, surely clear by now, is to dramatize the power of static forms and colors to stimulate dynamic psychological responses. Is this new *modus operandi* a means only or is it an end as well?

Many of the younger European artists in the exhibition have shown with the *Nouvelle Tendance*, an international fraternity of smaller groups initiated by an exhibition held in Zagreb in 1961. Although the members have no common program they share a desire to sweep away the mystery and sacred separateness that was the atmosphere of lyrical and tachist abstract art, striving only to "permit a confrontation with visual situations." They do not ask that the spectator be a rapt admirer but that he be a partner in reciprocal perceptual experiences. They try to make use of the newest methods and materials that industry has made available, the newest principles established by science, and even of mass production and distribution. They speak of the elements of their works as "information" and their compositional arrangement as "programming." In the case of the Italians of Gruppo N (recently dissolved) and the Spaniards of Equipo 57, im-

personal fabrication is extended to anonymity of authorship and almost to socialism. Yet these artists are not revolutionaries; they aspire to full cooperation with the modern world and are open to almost any application of their creativity.

By comparison with such aims, which recall those of the Bauhaus at Weimar, the American and English artists and some of the Europeans also are still individualists with a variety of personal approaches—although they too have jettisoned the subjectivity of the abstract-expressionist period. In New York a considerable flurry has been made about a new "cool" abstract dada, related to pop art, which finds value in resignation, emptiness, and meaninglessness. Exaggerated and temporary though this alleged nihilism may be, it is an American counterpart of the less febrile European rejection of romantic idealism and acceptance of a world of automation and computors.

It is impossible to generalize about individual artists. For many, perceptual abstraction is only a means, one to which they may have given hardly a passing thought. But it



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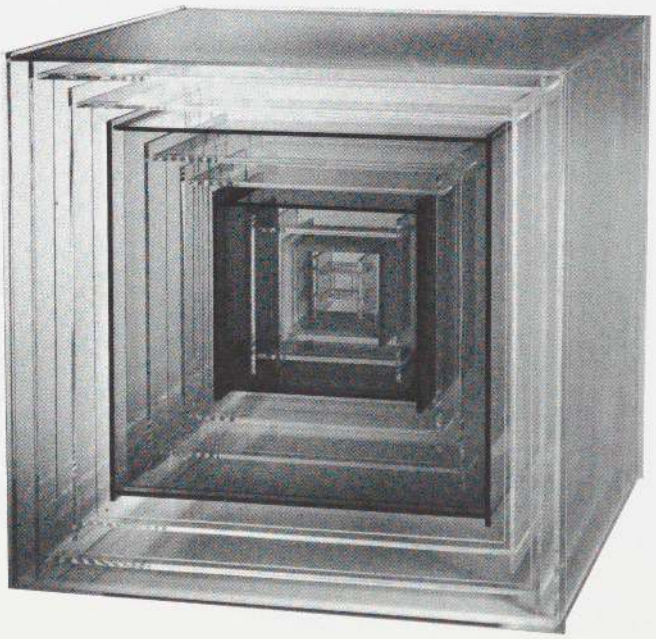
2

can be said without falsification that, seen together, these works inaugurate a new phase in the grammar of art that has already spread among free-brush abstract as well as figurative painters and has had its effect on sculpture too. Every new development merges at its periphery with other tendencies; purity is not necessarily a virtue in art. It is clear also how close to the border of science and technology some of the "hardcore" optical works are, and they remind us at the same time how close to art are some of the images of science.

The question of the connection of ends to means remains the most fascinating. Can such works, that refer to nothing outside themselves, replace with psychic effectiveness the content that has been abandoned? What are the potentialities of a visual art capable of affecting perception so physically and directly? Can an advanced understanding and application of functional images open a new path from retinal excitation to emotions and ideas?



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1. STEVENSON: *Optical Construction Number 2.* 1963. Plexiglas, 12¼ x 12¼ x 12¼″. Dwan Gallery, Los Angeles

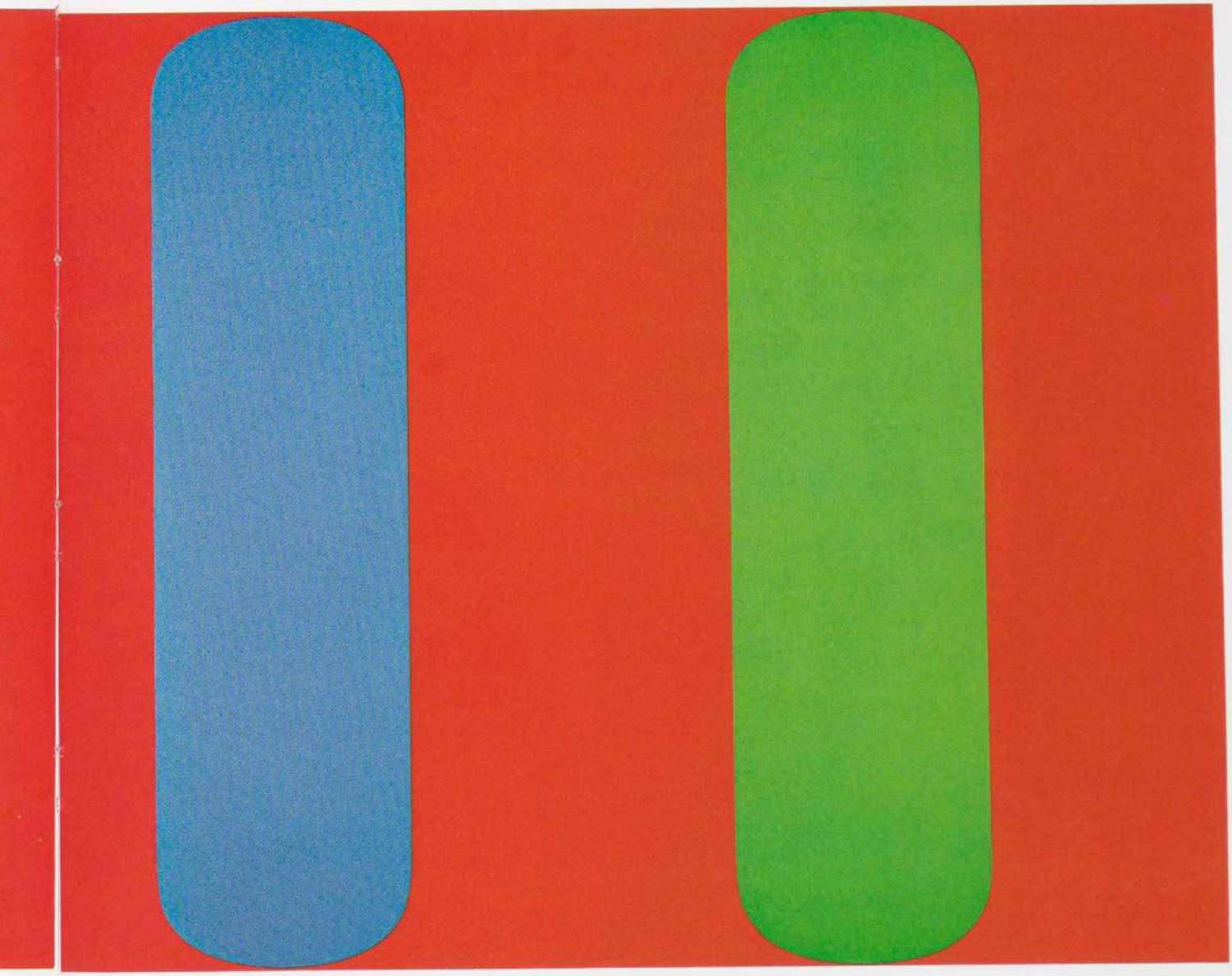
2. GERSTNER: *Lens Picture.* 1962-64. Plastic lens and transparency of concentric circles, 28 x 28″. Staempfli Gallery, New York

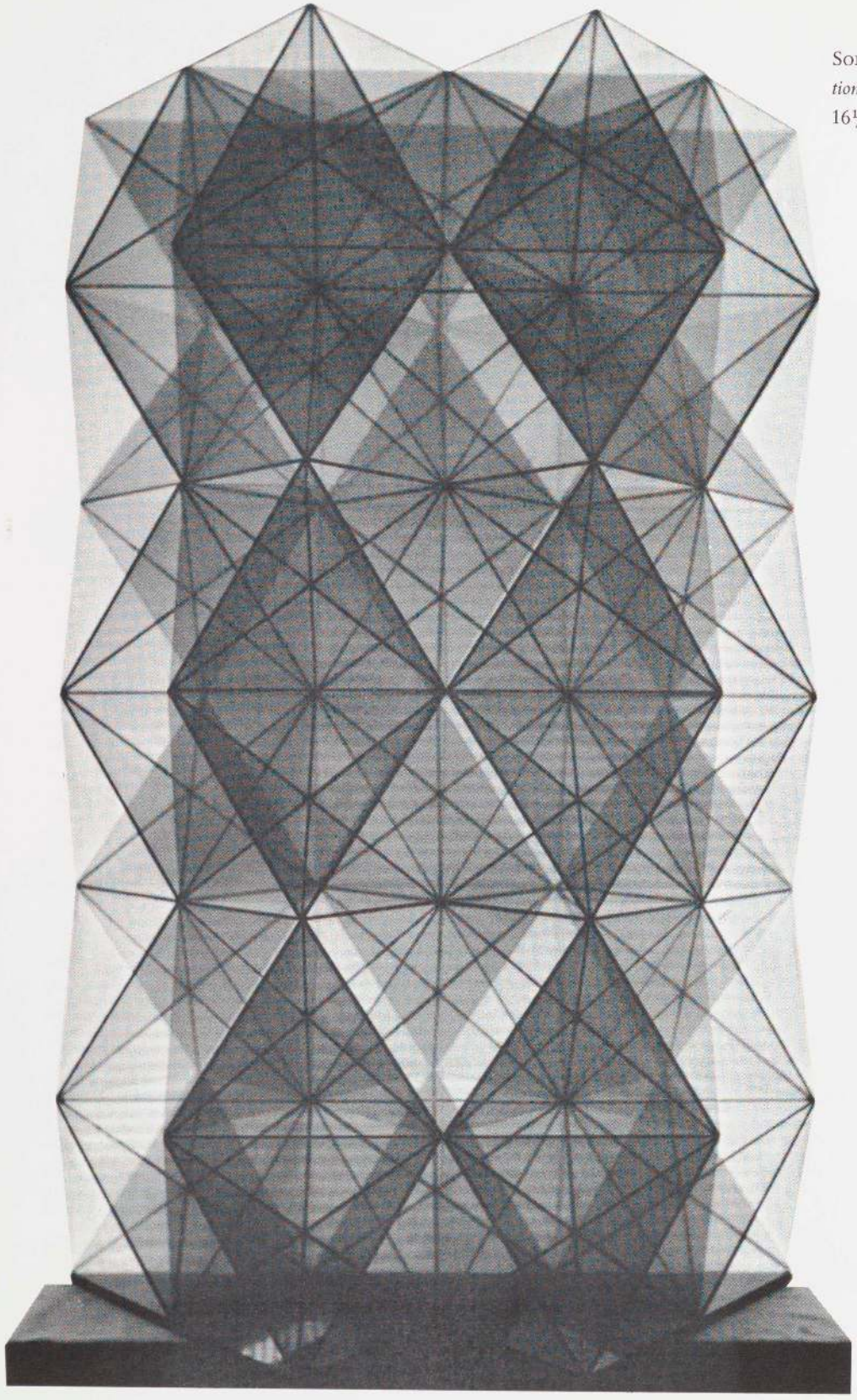
3. LAMIS: *Number 46.* 1964. Plexiglas, 13½ x 14 x 13¾″. Collection Mrs. Leroy Lamis, Terre Haute, Indiana



NOLAND: *And Again*. 1964. Acrylic on canvas, 69 x 69″. Private collection, Seattle

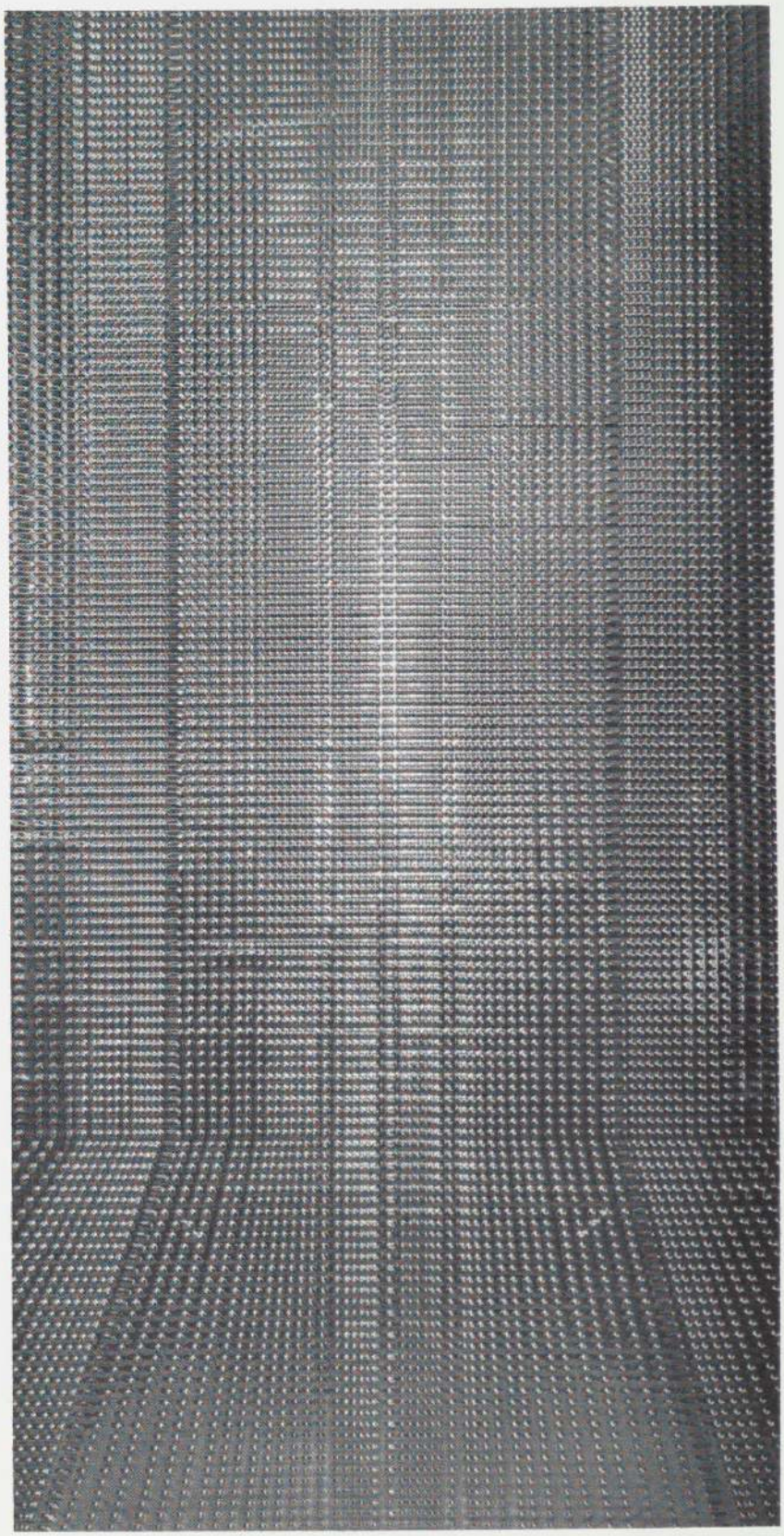
Right: KELLY: *Green Blue Red*. 1964. Oil on canvas, 6′ 1″ x 8′ 4″. Owned by the artist

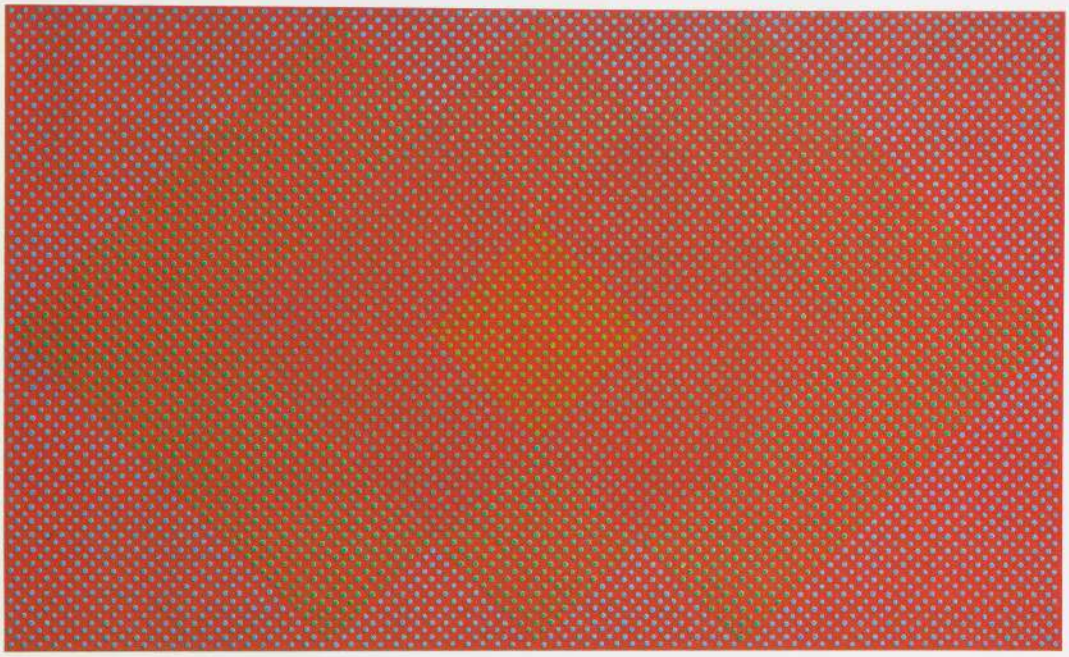




SOBRINO: *Unstable Transformation: Juxtaposition, Superposition D.* 1962. Plexiglas, 32⅜ x 16⅛ x 16⅛". Galerie Denise René, Paris

MACK: *Door of Paradise*. 1964. Aluminum on wood, 80 x 40″. Howard Wise Gallery, New York

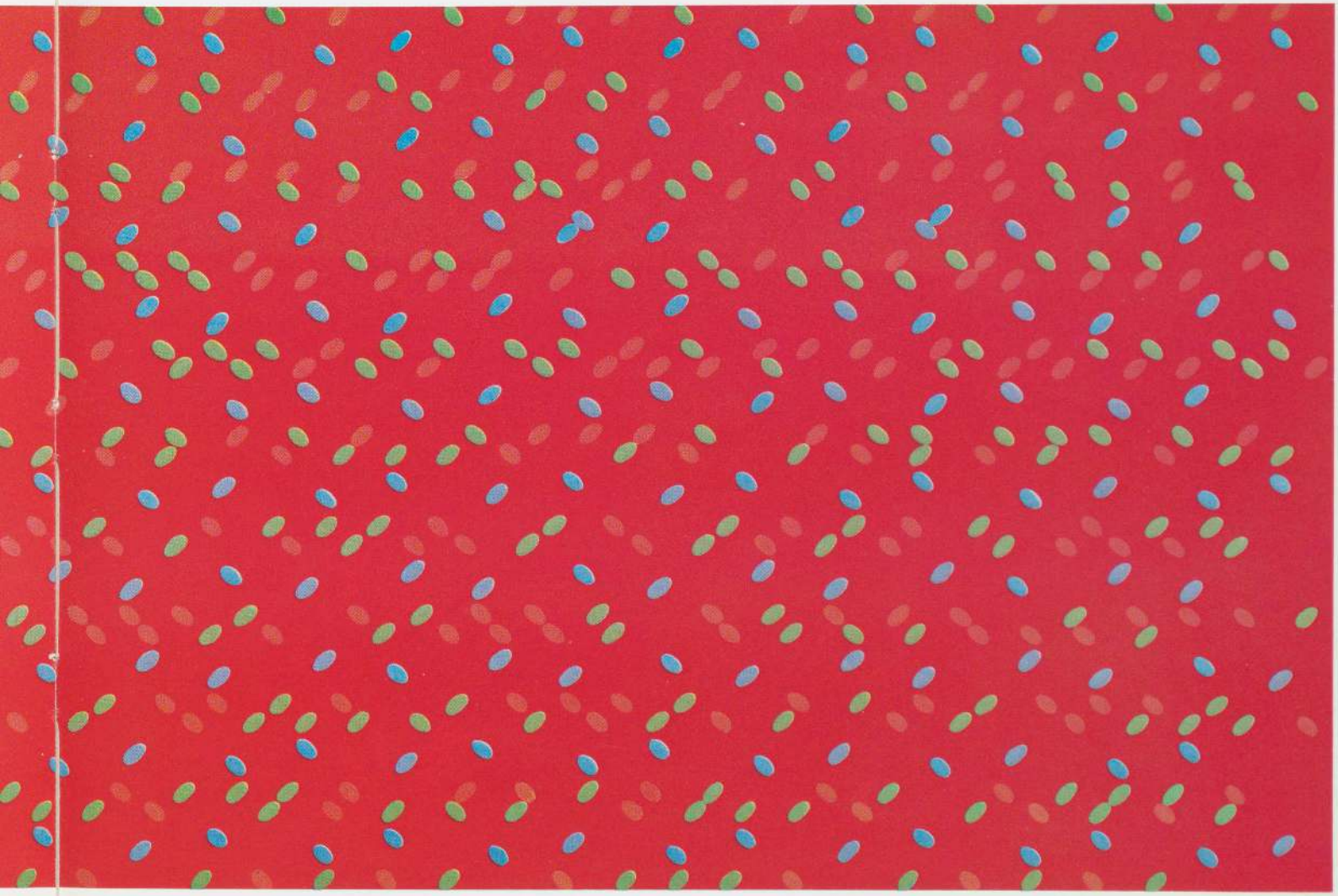




ANUSZKIEWICZ: *All Things Do Live in the Three*. 1963. Oil on canvas, 21 7/8 x 35 7/8". Collection Mr. and Mrs. Robert M. Benjamin, New York



Right: POONS: *Nixe's Mate*. 1964. Acrylic on canvas, 6' x 9'4". Collection Mr. and Mrs. Robert C. Scull, New York





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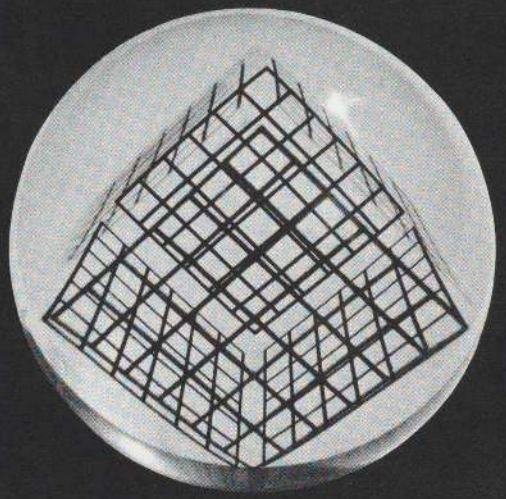

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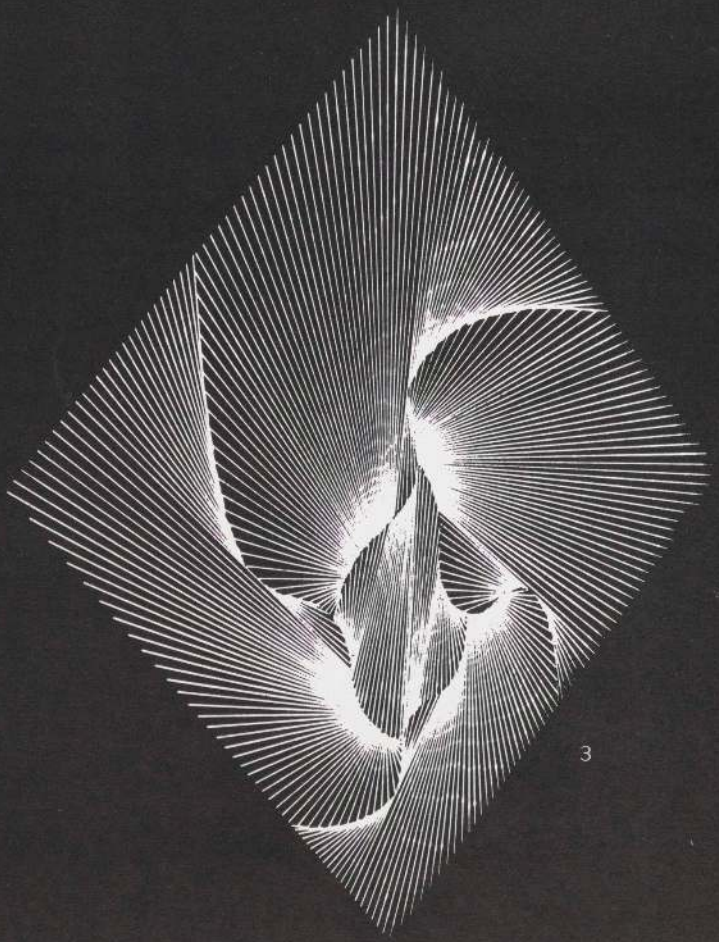

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4

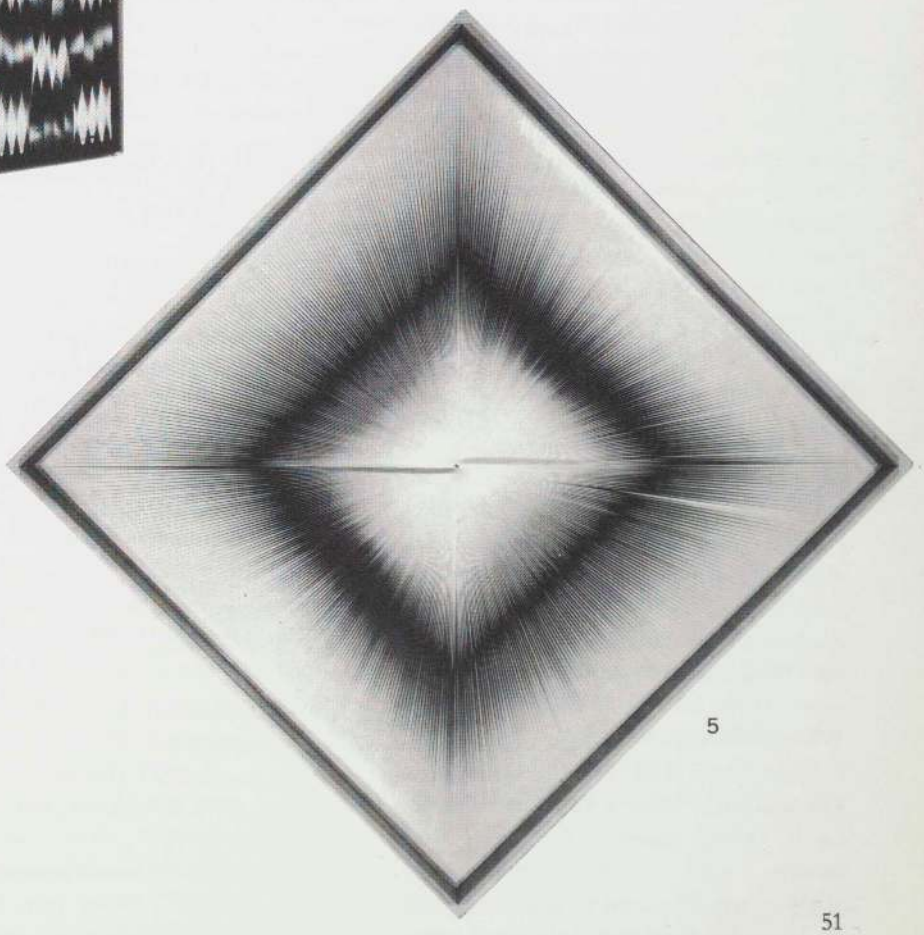
1. Tomasello: *Atmosphère Chromoplastique Number 109*. 1963. Painted wood relief, 39⅜ x 39⅜". Galerie Denise René, Paris

2. Mari: *Dynamic Optical Deformation of a Cube in a Sphere*. 1958-63. Transparent polyester resin, 4" diameter. Owned by the artist

3. Equipo 57: *V.25*. 1964. Engraving on glass, 47¼ x 47¼". Galerie Suzanne Bollag, Zurich

4. Leblanc: *Mobilo-statique*. 1962. Polyvinyl strips on wood, 39⅜ x 39⅜". Owned by the artist

5. Costa: *Visual Dynamics*. 1963. Polyethylene on wood, 39⅜ x 39⅜". Owned by the artist



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SCHEDULE OF THE EXHIBITION

The Museum of Modern Art, New York: February 23-April 25, 1965

City Art Museum of St. Louis: May 20-June 20, 1965

Seattle Art Museum: July 15-August 23, 1965

The Pasadena Art Museum: September 25-November 7, 1965

The Baltimore Museum of Art: December 14, 1965-January 23, 1966

LENDERS TO THE EXHIBITION

Marc Adrian, Vienna; Karl Benjamin, Claremont, California; Mr. and Mrs. Robert M. Benjamin, New York; Herbert C. Bernard, New York; Alberto Biasi, Padua; Mr. and Mrs. James H. Clark, Dallas; Mr. and Mrs. William N. Copley, New York; Toni Costa, Padua; Adam and Toby Emmerich, New York; Gunter Fruhtrunk, Paris; Gerhard von Graevenitz, Munich; Lily Greenham, Paris; Frederick Hammersley, Los Angeles; The Joseph H. Hirshhorn Collection, New York; Mr. and Mrs. Edwin Janss, Thousand Oaks, California; Philip Johnson, New York; Ellsworth Kelly, New York; Mrs. Leroy Lamis, Terre Haute, Indiana; Edoardo Landi, Padua; Walter Leblanc, Antwerp; Lynn Leland, New York; Wolfgang Ludwig, Berlin; Enzo Mari, Milan; Almir Mavignier, Ulm; Mr. and Mrs. Edgar B. Miller, Chicago; Roy Moyer, New York; Mr. and Mrs. Hans Neumann, Caracas; Eric H. Olson, Stockholm; Mrs. Bliss Parkinson, New York; Mr. and Mrs. Burton Peskin, Princeton, John G. Powers, New York; Karl Reinhartz, Munich; The Honorable Anthony Samuel, London; Mr. and Mrs. Robert C. Scull, New York; Dr. Maximilian Silbermann, New York, Mr. and Mrs. Sidney L. Solomon, New York; Ludwig Wilding, Augsburg, Walter Zehringer, Munich.

Calouste Gulbenkian Foundation, London; The Museum of Modern Art, New York; The Larry Aldrich Museum, Ridgefield, Connecticut.

Amel Gallery, New York; Ankrum Gallery, Los Angeles; Galleria del'Ariete, Milan; Bianchini Gallery, New York; Galerie Suzanne Bollag, Zurich; Galleria Cadario, Milan; Galerie Chalette, New York; Cordier & Ekstrom, New York; Dwan Gallery, Los Angeles; East Hampton Gallery, New York; Robert Elkon Gallery, New York; Martha Jackson Gallery, New York; Sidney Janis Gallery, New York; Samuel M. Kootz Gallery, New York; Kornblee Gallery, New York; Galerie Lambert, Paris; Felix Landau Gallery, Los Angeles; Marlborough-Gerson Gallery, New York; The Pace Gallery, New York; Betty Parsons Gallery, New York; Poindexter Gallery, New York; Stephen Radich Gallery, New York; Galerie Denise Rene, Paris; Bertha Schaefer Gallery, New York; Stable Gallery, New York; Staempfli Gallery, New York; Terrain Gallery, New York; Tibor De Nagy Gallery, New York; Howard Wise Gallery, New York.

CATALOGUE OF THE EXHIBITION

Works marked with an asterisk are illustrated. In dimensions, height precedes width. Wherever discrepancies occur between captions and this catalogue, the information given here is more recent.

ADRIAN, MARC. Austrian, born Vienna, 1930; lives in Vienna

1. *K 7.* 1962. Industrial glass over painted relief, 39⅜ x 42⅛". Owned by the artist

AGAM (Yaacov Gipstein). Israeli, born Rosh-on-le-Zion, 1928; lives in Paris

2. *Five Themes: Polyphonic Composition.* 1962-63. Oil on bronze, 5⅜ x 7". Collection Mr. and Mrs. Edgar B. Miller, Chicago

* 3. *Double Metamorphosis II.* 1964. Oil on aluminum, 8' 10" x 13'. Marlborough-Gerson Gallery, New York. Ill. p. 28

ALBERS, JOSEF. American, born Bottrop, Westphalia, 1888; lives in New Haven, Connecticut

4. *Late Sound.* 1957. Oil on composition board, 30 x 30". Sidney Janis Gallery, New York

* 5. *Far Off.* 1958. Oil on composition board, 29¾ x 29¾". Sidney Janis Gallery, New York. Ill. p. 21

6. *JHC I.* 1963. Engraving on plastic, 19⅜ x 26". Collection Mr. and Mrs. James H. Clark, Dallas, Texas

* 7. *JHC II.* 1963. Engraving on plastic, 19¼ x 25⅞". Collection Mr. and Mrs. James H. Clark, Dallas, Texas. Ill. p. 31

8. *Long Ago.* 1963. Oil on composition board, 39¾ x 39¾". Sidney Janis Gallery, New York

9. *Last Year.* 1964. Oil on composition board, 39⅝ x 39½". Sidney Janis Gallery, New York

10. *White Core.* 1964. Oil on composition board, 47⅝ x 47⅝". Sidney Janis Gallery, New York

11. *Wondering.* 1964. Oil on composition board, 47⅝ x 47⅝". Sidney Janis Gallery, New York

ALVIANI, GETULIO. Italian, born Udine, 1939; lives in Udine

12. *LL 36 Q 14x14 inv.* 1964. Aluminum, 33 x 33". Galleria Cadario, Milan.

ANUSZKIEWICZ, RICHARD J. American, born Erie, Pennsylvania, 1930; lives in Port Washington, New York

* 13. *All Things Do Live in the Three.* 1963. Acrylic on composition board, 21⅞ x 35⅞". Collection Mr. and Mrs. Robert M. Benjamin, New York. Ill. p. 48

14. *Degree of Vividness.* 1964. Acrylic on composition board, 48 x 48". Sidney Janis Gallery, New York

AVEDISIAN, EDWARD. American, born Lowell, Massachusetts, 1936; lives in New York

15. *Untitled.* 1964. Acrylic on canvas, 55 x 55". Collection John G. Powers, New York

BANNARD, WALTER DARBY. American, born New Haven, Connecticut, 1934; lives in Princeton, New Jersey

16. *Green Step.* 1963. Oil on canvas, 66¾ x 62⅞". Tibor De Nagy Gallery, New York

BECKMANN, HANNES. American, born Stuttgart, 1909; lives in New York

17. *Inca.* 1964. Acrylic on composition board, 30 x 30". East Hampton Gallery, New York

BELL, LARRY. American, born Chicago, 1939; lives in Los Angeles

18. *Glass Sculpture Number 10.* 1964. Metal and glass, 14 x 14 x 14″. Collection Mr. and Mrs. William N. Copley, New York

BENJAMIN, KARL STANLEY. American, born Chicago, 1925; lives in Claremont, California

19. *Number 27.* 1964. Oil on canvas, 51¼ x 38½″. Owned by the artist

BENKERT, ERNEST. American, born Chicago, 1928; lives in New York

20. *Black and White Op-Tickler.* 1964. Acrylic on composition board, 24 x 24″. Martha Jackson Gallery, New York

BERLEWI, HENRYK. Polish, born Warsaw, 1894; lives in Paris

* 21. *Mechano-Faktur: Construction in Six Squares.* 1963. Tempera on board, 26⅜ x 37½″. Owned by the artist. Ill. p. 37

BIASI, ALBERTO. Italian, born Padua, 1937; lives in Padua. (Formerly Gruppo N; see Gruppo N)

22. *Dynamic Vision S 9/2.* 1964. Serigraph on plexiglas and composition board, 19¾ x 19¾ x 3⅝″. Owned by the artist

BILL, MAX. Swiss, born Winterthur, 1908; lives in Zurich

23. *Four Colors around White Center.* 1961. Oil on canvas, 55½ x 55½″ diagonal. Staempfli Gallery, New York

BRACH, PAUL. American, born New York, 1924; lives in New York

24. *Section Number 1.* 1963-64. Oil on canvas, 67 x 67″. Cordier & Ekstrom Gallery, New York

CASTELLANI, ENRICO. Italian, born Castelmassa (Rovigo), 1930; lives in Milan

25. *White Surface Number 18.* 1964. Acrylic on structured canvas, 71 x 71″. Galleria del'Ariete, Milan

CELENTANO, FRANCIS. American, born New York, 1928; lives in New York

* 26. *Lavender Creed.* 1964. Acrylic on canvas, 52 x 96″. Howard Wise Gallery, New York. Ill. p. 36

COSTA, TONI. Italian, born Padua, 1935; lives in Padua. (Formerly Gruppo N; see Gruppo N)

* 27. *Visual Dynamics.* 1963. Polyethylene on wood, 39⅜ x 39⅜″. Owned by the artist. Ill. p. 51

CRUZ-DIEZ, CARLOS. Venezuelan, born Caracas, 1923; lives in Paris

* 28. *Physichromie Number 116.* 1964. Transparent plastic on wood panel, 39⅞ x 40¼″. Collection Hans Neumann, Caracas. Ill. p. 29

CUNNINGHAM, BENJAMIN FRAZIER. American, born Cripple Creek, Colorado, 1904; lives in New York

* 29. *Equivocation.* 1964. Acrylic on composition board, 26 x 25½″. East Hampton Gallery, New York. Ill. p. 27

DAVIS, GENE. American, born Washington, D.C., 1920; lives in Washington, D.C.

* 30. *Black-Gray Beat.* 1964. Acrylic on canvas, 8 x 16′. Poindexter Gallery, New York. (Exhibited in New York only.) Ill. p. 14

31. *Black Rhythm.* 1964. Acrylic on canvas, 8′ x 7′ 6″. Collection Vincent Melzac, Washington, D.C. (Exhibited outside New York only)

DE LAP, TONY. American, born Oakland, California, 1927; lives in San Francisco

32. *Magpie.* 1963. Metal and canvas, 30 x 30 x 2¼″. The Larry Aldrich Museum, Ridgefield, Connecticut

DEMARCO, HUGO RUDOLFO. Argentine, born Buenos Aires, 1932; lives in Paris

33. *Spatial Dynamism.* 1964. Plastic and wood, 45⅜ x 45⅜″. Galerie Denise Rene, Paris

DORAZIO, PIERO. Italian, born Rome, 1927; lives in Rome

34. *Beyond Two Meters.* 1964. Oil on canvas, 6′ 5″ x 7′ 3″. Marlborough-Gerson Gallery, New York

* 35. *Construction Eurasia.* 1964. Oil on canvas, 68 x 96½″. Marlborough-Gerson Gallery, New York. Ill. p. 10

DOWNING, THOMAS. American, born Suffolk, Virginia, 1928; lives in Washington, D.C.

36. *Pool.* 1963. Acrylic on canvas, 54 x 54″. Stable Gallery, New York

EQUIPO 57. A Spanish group exhibiting anonymously, comprising Juan Cuenca, Angel Duart, José Duarte, Agustin Ibarrola, Juan Serrano

* 37. *PA-18.* 1959. Oil on canvas, 57½ x 44⅞″. Collection Herbert C. Bernard, New York. Ill. p. 23

* 38. *V. 25.* 1964. Engraving on glass, 47¼ x 47¼″ diagonal. Galerie Suzanne Bollag, Zurich. Ill. p. 50

FANGOR, WOJCIECH. Polish, born Warsaw, 1922; lives in Paris

* 39. *Multicolored Target Number 17.* 1963. Oil on canvas, 41⅝ x 41⅝″. Galerie Lambert, Paris. Ill. p. 29

FEELEY, PAUL. American, born Des Moines, Iowa, 1913; lives in Bennington, Vermont

* 40. *Alniam.* 1964. Acrylic on canvas, 60 x 60″. Collection Philip Johnson, New York. Ill. p. 13

FEITELSON, LORSER. American, born Savannah, Georgia, 1898; lives in Los Angeles

* 41. *Hard-Edge Line Painting.* 1964. Oil and enamel on canvas, 60 x 40″. Ankrum Gallery, Los Angeles. Ill. p. 22

FOYSTER, JERRY. American, born Albany, New York, 1932; lives in Brooklyn, New York

42. *Plastic Animation Number 453.* 1964. Ink on paper with plastic, 60 x 60″. Bianchini Gallery, New York

FRUHTRUNK, GÜNTER. German, born Munich, 1923; lives in Paris

43. *Blue out of Orange.* 1963. Acrylic on composition board, 33½ x 33½″. Owned by the artist

FULLER, SUE. American, born Pittsburgh, 1914; lives in New York

44. *String Composition Number 119.* 1964. Polypropylene thread in plexiglas, 36 x 36″. Bertha Schaefer Gallery, New York

GARCIA ROSSI, HORACIO. Argentine, born Buenos Aires, 1929; lives in Vaires-sur-Marne (Seine et Marne), France. (Member of the

Groupe de Recherche d'Art Visuel)

45. *Interpenetration of Three Colors.* 1959. Tempera on wood, 16⅝ x 33⅛″. Galerie Denise René, Paris

GEGO (Gertrude Goldschmidt). Venezuelan, born Hamburg, Germany, 1912; lives in Caracas

46. *Sphere.* 1959. Welded iron painted black, 23½″ high. The Museum of Modern Art, New York, Inter-American Fund

GERSTNER, KARL. Swiss, born Basel, 1930; lives in Basel

* 47. *Lens Picture.* 1962-64. Plastic lens and transparency of concentric circles, 28 x 28″. Staempfli Gallery, New York. Ill. p. 42

48. *Tension Picture.* 1962-64. Illuminated plastic and wood, 28 x 28″. Staempfli Gallery, New York

GOODYEAR, JOHN. American, born Southgate, California, 1930; lives in Lebanon, New Jersey

49. *Color Block.* 1964. Painted wood, 24 x 24″. Amel Gallery, New York

VON GRAEVENITZ, GERHARD. German, born Schilde, Brandenburg, 1934; lives in Munich

50. *Series 3, Number 12.* 1961. Plaster on wood, 23⅝ x 23⅝″. Owned by the artist

GREENHAM, LILY. Austrian and Danish, born Vienna, 1928; lives in Paris

51. *Study of Differentiation and Identity in Visual Perception: Three Variations.* 1964. Collage on wood, each 16⅛ x 16⅛″. Owned by the artist

GRUPPO N. An Italian group exhibiting anonymously, located in Padua, disbanded in 1964, comprising Alberto Biasi, Ennio Chiggio, Toni Costa, Edoardo Landi, Manfredo Massironi

* 52. *Unstable Perception.* 1963. Metal, 17⅞ x 18 x 3½″. The Museum of Modern Art, New York, gift of the Olivetti Corporation. Ill. p. 4

HAMMERSLEY, FREDERICK. American, born Salt Lake City, Utah, 1919; lives in Los Angeles

53. *That, Number 3964.* 1964. Oil on canvas, 33⅛ x 51⅛″. Owned by the artist

HEWITT, FRANCIS RAY. American, born Springfield, Vermont, 1936; lives in Amsterdam

54. *Abe's Box.* 1964. Acrylic on canvas, 36 x 36″. Martha Jackson Gallery, New York

IRWIN, ROBERT. American, born Long Beach, California, 1928; lives in Los Angeles

55. *Untitled.* 1963. Oil on canvas, 7′ x 6′11″. Collection Mr. and Mrs. Edwin Janss, Thousand Oaks, California

KELLY, ELLSWORTH. American, born Newburgh, New York, 1923; lives in New York

* 56. *Green Blue Red.* 1964. Oil on canvas, 6′ 1″ x 8′ 4″. Owned by the artist. Ill. p. 45

KIDNER, MICHAEL JAMES. British, born Kettering, 1917; lives in London

57. *Orange, Green and Blue.* 1964. Oil on canvas, 49 x 60″. Calouste Gulbenkian Foundation, London

KOMODORE, WILLIAM. American, born Athens, 1932; lives in New York

58. *Vermont.* 1964. Acrylic on canvas, 63 x 63″. Howard Wise Gallery, New York

LAMIS, LEROY. American, born Eddyville, Iowa, 1925; lives in Terre Haute, Indiana

* 59. *Number 46.* 1964. Plexiglas, 13½ x 14 x 13¾″. Collection Mrs. Leroy Lamis, Terre Haute, Indiana. Ill. p. 43

LANDI, EDOARDO. Italian, born San Felice sul Panaro (Modena), 1937; lives in Padua. (Formerly Gruppo N; see Gruppo N)

60. *Dynamic Optical Structure.* 1964. Plastic, liquid and wood, 21 x 20¾″. Owned by the artist

LEBLANC, WALTER. Belgian, born Antwerp, 1932; lives in Antwerp

* 61. *Mobilo-statique.* 1962. Polyvinyl strips on wood, 39⅜ x 39⅜″. Owned by the artist. Ill. p. 51

LELAND, LYNN G. American, born Buffalo, New York, 1937; lives in New York

62. *Untitled.* 1964. Acrylic on canvas, 47 x 47″. Owned by the artist

LE PARC, JULIO. Argentine, born Mendoza, 1928; lives in Paris. (Member of the Groupe de Recherche d'Art Visuel)

63. *Instability through Movement of the Spectator.* 1962-64. Aluminum and wood, 56¾ x 36⅝ x 28⅜″. Galerie Denise René, Paris

LEVINSON, MON. American, born New York, 1926; lives in New York

* 64. *Black Moving Planes XIX.* 1964. Plexiglas, acetate and paper, 30 x 21⅞″. Kornblee Gallery, New York. Ill. p. 40

LIBERMAN, ALEXANDER. American, born Kiev, Russia, 1912; lives in New York

* 65. *Exchange.* 1952. Oil and enamel on composition board, 21 x 50″. Betty Parsons Gallery, New York. Ill. p. 19

* 66. *Continuous on Red.* 1960. Oil on circular canvas, 80″ diameter. The Museum of Modern Art, New York, gift of Mr. and Mrs. Fernand Leval. (Exhibited in New York only.) Ill. p. 25

LIPPOLD, RICHARD. American, born Milwaukee, Wisconsin, 1915; lives in Locust Valley, New York

67. *The Seed.* 1958. Metal wire, 9½ x 5 x 5″. Collection Mrs. Bliss Parkinson, New York. (Exhibited in New York only)

LOUIS, MORRIS. American, born Baltimore, Maryland, 1912; died Washington, D.C., 1962

* 68. *Number 33.* 1962. Acrylic on canvas, 87¼ x 34⅝″. Collection Adam and Toby Emmerich, New York. Ill. p. 11

LUDWIG, WOLFGANG. German, born Mielesdorf, 1923; lives in Berlin

* 69. *Cinematic Painting.* 1964. Oil on composition board, 24⅛ x 48⅛″. Owned by the artist. Ill. p. 9

MACHLIN, SHELDON. American, born New York, 1918; lives in Brooklyn, New York

70. *Space Box.* 1963. Painted aluminum, 6 x 17½ x 5″. Bertha Schaefer Gallery, New York

MACK, HEINZ. German, born Lollar, Westphalia, 1931; lives in Düsseldorf. (Member of Group Zero)

* 71. *Door of Paradise.* 1964. Aluminum on

wood, 80 x 40″. Howard Wise Gallery, New York, Ill. p. 47

MARI, ENZO. Italian, born Novara, 1932; lives in Milan

72. *Structure Number 725.* 1962. Aluminum and wood, 23⅝ x 23⅝ x 4″. Owned by the artist

* 73. *Dynamic Optical Deformation of a Cube in a Sphere.* 1958-63. Transparent polyester resin, 4″ diameter. Owned by the artist. Ill. p. 50

MARTIN, AGNES. American, born Maklin, Canada, 1921; lives in New York

74. *The Tree.* 1964. Oil and pencil on canvas, 6′ x 6′. The Museum of Modern Art, New York, Larry Aldrich Foundation Fund

MAVIGNIER, ALMIR. Brazilian, born Rio de Janeiro, 1925; lives in Ulm (Donau), Germany

* 75. *Concave-Convex Planes.* 1963. Oil on canvas, 55⅛ x 78¾″. Owned by the artist. Ill. p. 33

76. *Vibration on Red.* 1964. Oil on canvas, 55⅝ x 39⅜″. Owned by the artist

MCLAUGHLIN, JOHN. American, born Sharon, Massachusetts, 1898; lives in Dana Point, California

77. *Number 7.* 1962. Oil on canvas, 48 x 60″. Felix Landau Gallery, Los Angeles

MIECZKOWSKI, EDWIN. American, born Pittsburgh, 1929; lives in Cleveland, Ohio

78. *Fuseli's Box.* 1964. Acrylic on composition board, 24 x 24″. Collection Mr. and Mrs. Burton Peskin, Princeton, New Jersey

MOLINARI, GUIDO. Canadian, born Montreal, 1933; lives in Montreal

* 79. *Mutation: Verte et Rouge.* 1964. Acrylic on canvas, 6′ 7″ x 8′. East Hampton Gallery, New York. Ill. p. 12

MORELLET, FRANCOIS. French, born Cholet (Maine et Loire), 1926; lives in Cholet. (Member of the Groupe de Recherche d'Art Visuel)

* 80. *Screen Painting: 0°, 22°5, 45°, 67°5.* 1958. Oil on canvas, 55⅛ x 55⅛″. Galerie Denise René, Paris. Ill. p. 35

NEAL, REGINALD. American, born Leicester, England, 1909; lives in Lebanon, New Jersey

81. *Square of Three: Black and Yellow.* 1964. Lithograph and oil on canvas, 32⅝ x 32⅝″. Amel Gallery, New York

NOLAND, KENNETH. American, born Asheville, North Carolina, 1924; lives in South Shaftsbury, Vermont

* 82. *And Again.* 1964. Acrylic on canvas, 8′ 4″ x 8′ 4″ diagonal. Private collection, Seattle. Ill. p. 44

OLSON, ERIC. Swedish, born Malmö, 1909; lives in Stockholm

83. *Optochromi G.5.* 1963-64. Glass with polarization and birefringence sheets, 14¾ x 6⅝ x 3¾″ including metal base. Owned by the artist

OSTER, GERALD. American, born Providence, Rhode Island, 1918; lives in New York

84. *Triple Radial.* 1964. Serigraph on plastic and paper, and wood, 41 x 43″. Howard Wise Gallery, New York

PEARSON, HENRY C. American, born Kinston, North Carolina, 1914; lives in New York

85. *Black on White.* 1964. Oil on canvas, 6′ 6″ x 6′ 6″. Stephen Radich Gallery, New York

PICELJ, IVAN. Yugoslav, born Okucani, 1924; lives in Zagreb

86. *Surface XXXIV.* 1964. Painted wood, 39⅜ x 39⅜″. Galerie Denise René, Paris

POHL, ULI. German, born Munich, 1935; lives in Munich

* 87. *PX II/3010-59/64.* 1964. Plexiglas. 27¾″ high including base x 16⅞ x 3⅞″. The Joseph H. Hirshhorn Collection. Ill. p. 4

POONS, LARRY. American, born Tokyo, 1937; lives in New York

* 88. *Nixe's Mate.* 1964. Acrylic on canvas, 6′ x 9′ 4″. Collection Mr. and Mrs. Robert C. Scull, New York. Ill. p. 49

REINHARDT, AD. American, born Buffalo, New York, 1913; lives in New York

* 89. *Red Painting Number 7.* 1952. Oil on canvas, 6′ 4″ x 12′. Betty Parsons Gallery, New York. (Exhibited in New York only.) Ill. p. 16

90. *Red Painting Number 15.* 1952. Oil on canvas, 60 x 80″. Betty Parsons Gallery, New York. (Exhibited outside New York only)

REINHARTZ, KARL. German, born Herne, Westphalia, 1932; lives in Munich

91. *64/8.* 1964. Painted wood, 31½ x 63″. Owned by the artist

RILEY, BRIDGET. British, born London, 1931; lives in London

* 92. *Current.* 1964. Emulsion on composition board, 58⅜ x 58⅞″. The Museum of Modern Art, New York, Philip C. Johnson Fund. Ill. p. 34

93. *Hesitate.* 1964. Emulsion on composition board, 45½ x 45¾″. The Larry Aldrich Museum, Ridgefield, Connecticut

SANDER, LUDWIG. American, born New York, 1906; lives in New York

94. *Chippewa III.* 1964. Oil on canvas, 6′ 6″ x 6′. Kootz Gallery, New York

SCHMIDT, ARNOLD. American, born Plainfield, New Jersey, 1930; lives in New York

95. *Atina.* 1964. Acrylic on canvas, 48 x48″. Terrain Gallery, New York

SEDGELY, PETER. British, born 1930; lives in London

* 96. *Blue and Green Modulation.* 1964. Emulsion on composition board, 39½ x 39½″. Howard Wise Gallery, New York. Ill. p. 4

SEMPERE, EUSEBIO. Spanish, born Onil, 1924; lives in Madrid

97. *Hanging Screens.* 1963. Steel, 26⅝ x 19¼″. Collection Dr. Maximilian Silbermann, New York

SIHVONEN, OLI. American, born Brooklyn, New York, 1931; lives in Taos, New Mexico

98. *Duplex.* 1963. Oil on canvas, 56 x 52″. Stable Gallery, New York

SKINNER, CLARA. American, born Chicago, 1915; lives in Easthampton, Connecticut

99. *Number 5.* 1964. Serigraph on glass and plastic, and wood, 48 x 48″. Collection John G. Powers, New York

SMITH, LEON POLK. American, born Indian Territory (Oklahoma), 1906; lives in New York

100. *C White-Orange*. 1964. Oil on canvas, 68 x 60″. Galerie Chalette, New York

SOBRINO, FRANCISCO. Spanish, born Guadalajara, 1932; lives in Paris. (Member of the Groupe de Recherche d'Art Visuel)

*101. *Unstable Transformation: Juxtaposition, Superposition D*. 1962. Plexiglas, 32⅜ x 16⅛ x 16⅛″. Galerie Denise René, Paris. Ill. p. 46

STANCZAK, JULIAN. American, born Poland, 1928; lives in Cleveland

102. *Ulterior Images*. 1962. Acrylic on canvas, 54½ x 73¼″. Martha Jackson Gallery, New York

STEELE, JEFFREY. British, born Cardiff, Wales, 1931; lives in Cardiff

*103. *Baroque Experiment: Fred Maddox*. 1964. Oil on canvas, 60 x 40″. Collection The Hon. Anthony Samuel, London. Ill. p. 4

STEIN, JOËL. French, born Boulogne-sur-Mer, 1926; lives in Paris. (Member of the Groupe de Recherche d'Art Visuel)

*104. *Optical Variations on Metal Screening*. 1964. Metal on wood, 39⅜ x 39⅜″. Galerie Denise René, Paris. Ill. p. 37

STELLA, FRANK. American, born Malden, Massachusetts, 1936; lives in New York

*105. *Line Up*. 1962. Oil on canvas, 6′ 5″ x 6′ 5″. The Joseph H. Hirshhorn Collection. Ill. p. 24

STEVENSON, ROBERT. American, born San Diego, California, 1924; lives in Los Angeles

*106. *Optical Construction Number 2*. 1963. Plexiglas, 12¼ x 12¼ x 12¼″. Dwan Gallery, Los Angeles. Ill. p. 42

STROUD, PETER ANTHONY. British, born 1921; lives in Bennington, Vermont

*107. *Orange Circumvert with Yellow*. 1964. Compound emulsion on plywood, 55⅛ x 60¼″. Marlborough-Gerson Gallery, New York. Ill. p. 20

SUTEJ, MIROSLAV. Yugoslav, born Duga Resa, 1936; lives in Zagreb

108. *Bombardment of the Optic Nerve II*. 1963. Oil, 78¾″ diameter. Owned by the artist

TADASKY (Tadasuke Kuwayama). Japanese, born Nagoya, 1935; lives in New York

*109. *A-101*. 1964. Oil on canvas, 52 x 52″. The Museum of Modern Art, New York, Larry Aldrich Foundation Fund. Ill. p. 32

TOMASELLO, LUIS. Argentine, born La Plata, 1915; lives in Paris

*110. *Atmosphère Chromoplastique Number 109*. 1963. Painted wood relief, 39⅜ x 39⅜″. Galerie Denise René. Ill. p. 50

TOUSIGNANT, CLAUDE. Canadian, born Montreal, 1932; lives in Montreal

111. *L'Empêcheur de Tourner en Rond*. 1964. Acrylic on canvas, 72x72″. East Hampton Gallery, New York

TSAI, WEN-YING. American, born Amoy, China, 1928; lives in New York

112. *Random Field*. 1964. Acrylic on composition board and canvas, 60x78″. Amel Gallery, New York

UECKER, GÜNTHER. German, born Mecklenburg, 1930; lives in Düsseldorf. (Member of Group Zero)

113. *Moving Light*. 1960. Nails on canvas and wood, 47 x 47″. Howard Wise Gallery, New York

VASARELY, VICTOR DE. French, born Pecs, Hungary, 1908; lives in Arcueil (Seine)

114. *Monastir*. 1958. Etched and painted glass, and metal; 31¼ x 24½ x 6⅜″. Collection Mr. and Mrs. Sidney L. Solomon, New York

115. *Torke*. 1958. Painted glass and metal, 32¼ x 24⅜ x 6⅜″. Galerie Denise René, Paris

116. *Betelgeuse I*. 1963. Painted metal, 8′ 2⅜″ x 8′ 2⅜″ x 31½″. Galerie Denise René, Paris

*117. *Kalota*. 1963. Oil on canvas, 7′ x 6′ 8″. Pace Gallery, New York. Ill. p. 6

*118. *Orion MC*. 1963. Collage, 6′ 10¾″ x 6′ 6¾″. Galerie Denise René, Paris. Ill. p. 26

119. *Tlinko I*. 1963. Painted metal, 10′ x 10′. Galerie Denise René, Paris

WILDING, LUDWIG. German, born Grünstadt, Pfalz, 1927; lives in Westheim, Augsburg

*120. *Kinetic Structure 5/63*. 1963. Tempera on wood with plastic cord, 33⅞ x 26 x 3¼″. Owned by the artist. Ill. p. 39

YVARAL (Jean Pierre Vasarely). French, born Paris, 1934; lives in Arcueil (Seine). (Member of the Groupe de Recherche d'Art Visuel)

121. *Instability Number 18*. 1961. Painted plastic and wood, 20⅞ x 19⅞ x 10″. Collection Roy Moyer, New York

*122. *Acceleration Number 19, Series B*. 1962. Plastic and wood, 23⅞ x 24⅜ x 3⅛″. The Museum of Modern Art, New York, gift of Philip Johnson. Ill. p. 40

ZEHRINGER, WALTER. German, born Memmingen, 1940; lives in Munich

123. *Number 2*. 1964. Plexiglas and painted plastic, 31½ x 31½ x 2¾″. Owned by the artist

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COVER: Background from a detail of Bridget Riley's *Current*. 1964

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